IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

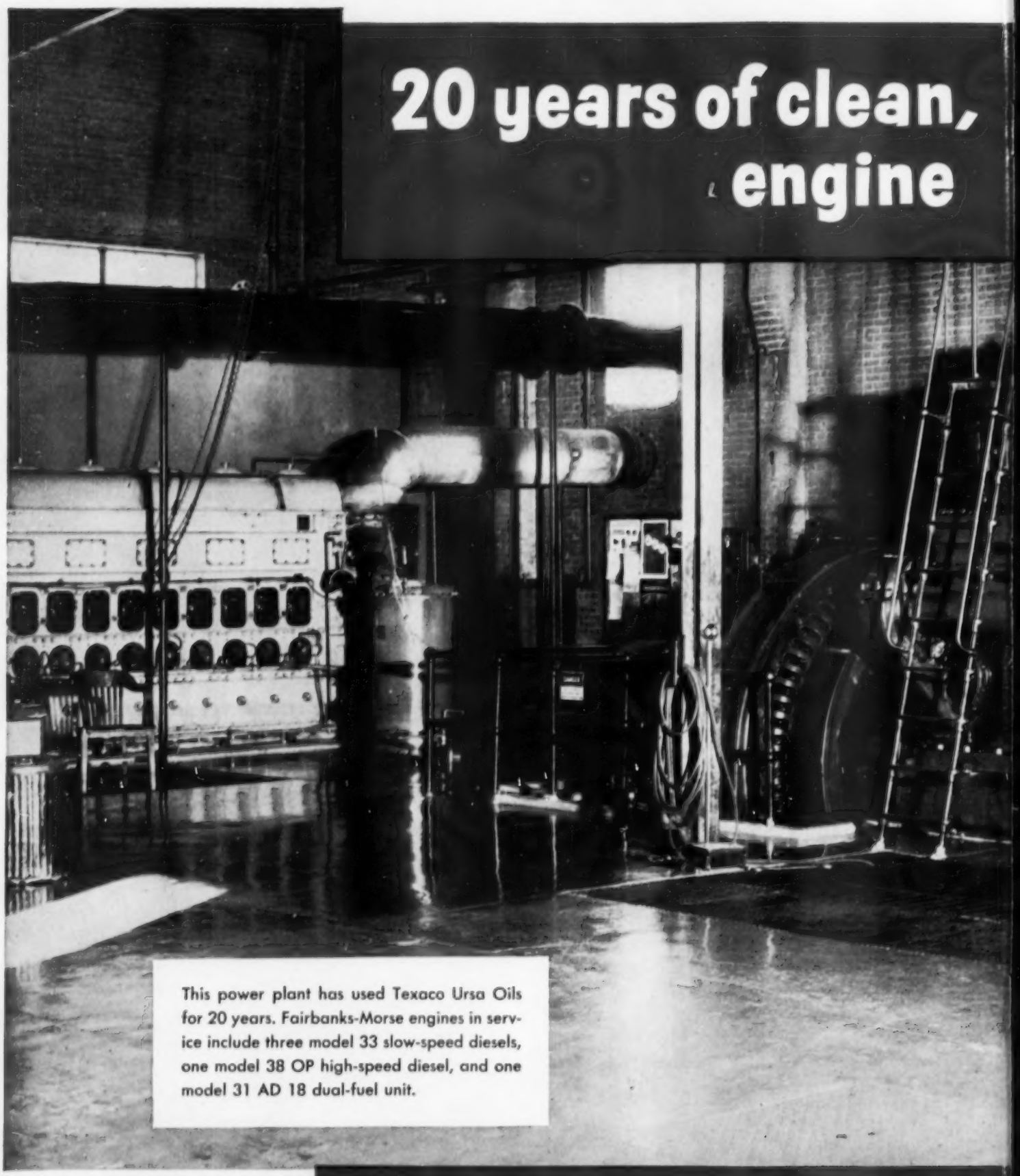
DIESEL PROGRESS

FIVE DOLLARS PER YEAR

SEPTEMBER, 1955

FIFTY CENTS PER COPY

20 years of clean, engine



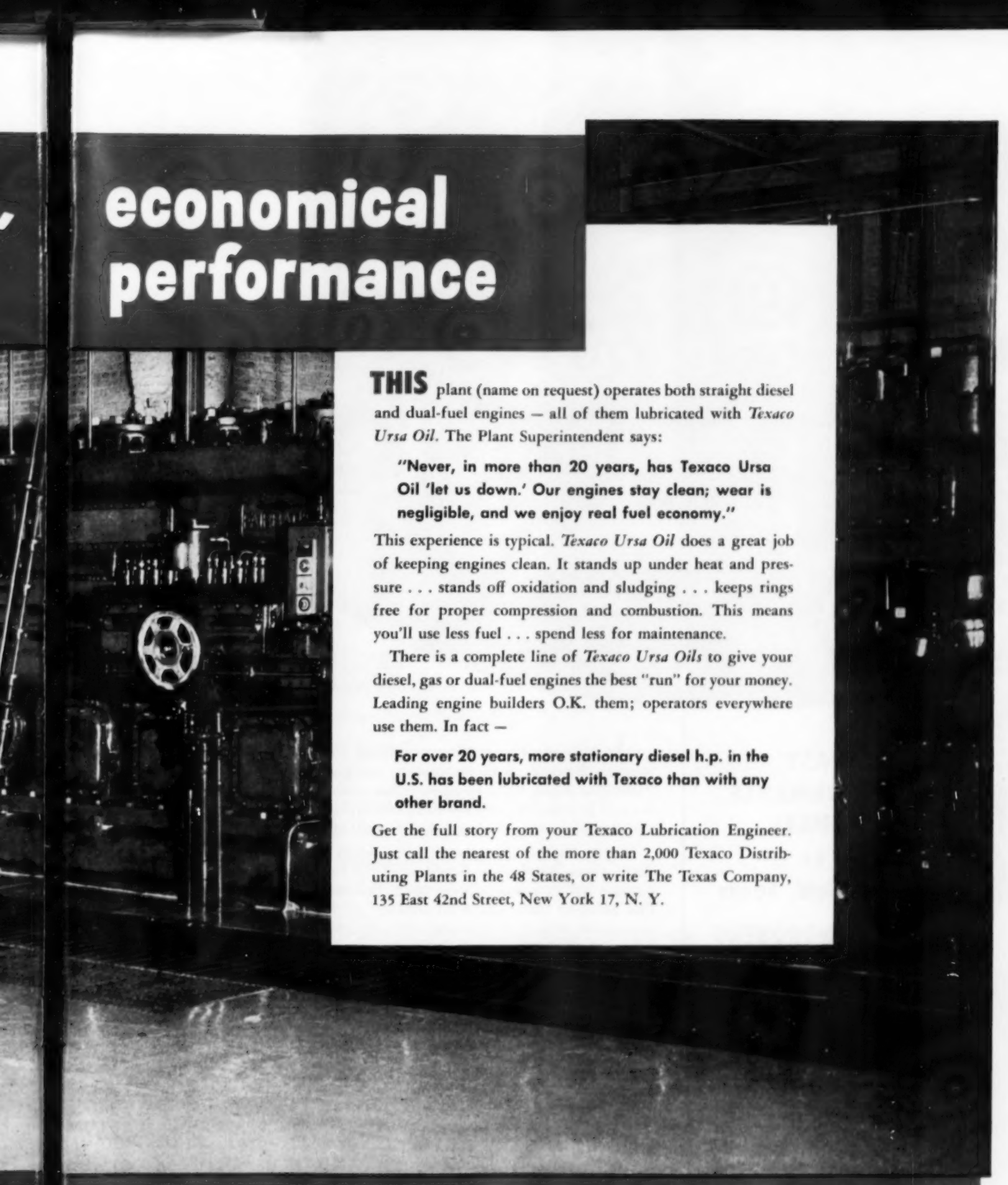
This power plant has used Texaco Ursa Oils for 20 years. Fairbanks-Morse engines in service include three model 33 slow-speed diesels, one model 38 OP high-speed diesel, and one model 31 AD 18 dual-fuel unit.

TUNE IN:
TEXACO STAR THEATER
starring
JIMMY DURANTE
on television...
Saturday nights, NBC.

TEXACO

TEXACO

economical performance



THIS plant (name on request) operates both straight diesel and dual-fuel engines — all of them lubricated with *Texaco Ursa Oil*. The Plant Superintendent says:

> **"Never, in more than 20 years, has Texaco Ursa Oil 'let us down.' Our engines stay clean; wear is negligible, and we enjoy real fuel economy."**

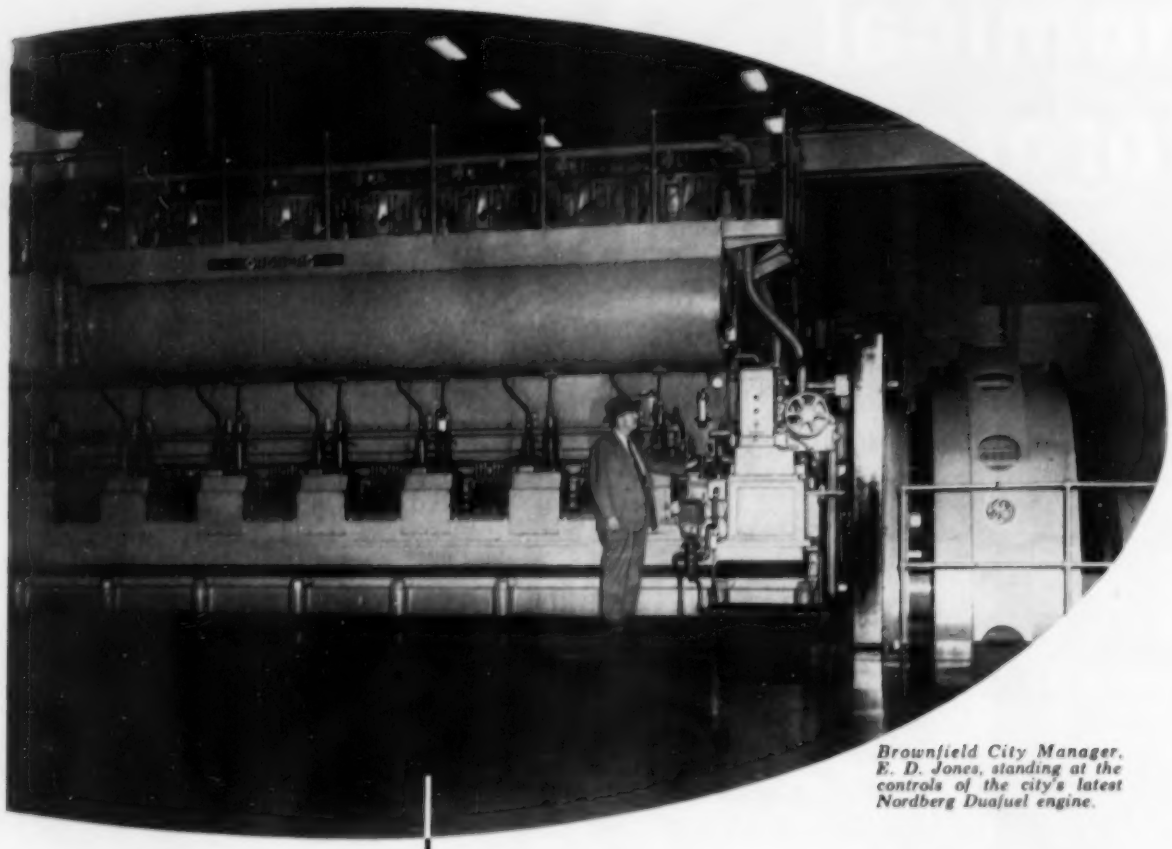
This experience is typical. *Texaco Ursa Oil* does a great job of keeping engines clean. It stands up under heat and pressure . . . stands off oxidation and sludging . . . keeps rings free for proper compression and combustion. This means you'll use less fuel . . . spend less for maintenance.

There is a complete line of *Texaco Ursa Oils* to give your diesel, gas or dual-fuel engines the best "run" for your money. Leading engine builders O.K. them; operators everywhere use them. In fact —

> **For over 20 years, more stationary diesel h.p. in the U.S. has been lubricated with Texaco than with any other brand.**

Get the full story from your Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES



Brownfield City Manager, E. D. Jones, standing at the controls of the city's latest Nordberg Duafuel engine.

PAST PERFORMANCE COUNTS at Brownfield, Texas

Second NORDBERG Duafuel® Engine matches economy and reliability of first

IN 1951, the City of Brownfield, Texas placed its first Nordberg Duafuel® engine in municipal power plant service. This engine, driving a 2000 kw generator, has consistently turned in a good performance record and after 22,000 hours of operation, the only major maintenance required was one set of piston rings.

On the basis of this performance, Brownfield selected and installed its second Nordberg in 1954 . . . another Duafuel engine driving a 2700 kw generator. States Mr. E. D. Jones, Brownfield City Manager, "Reliability is no problem . . . the Nordberg engines pull 90% of the load with other engines carrying the balance. Both Nordbergs are compiling fine records of performance . . . the newest Nordberg has been on the line over 4,000 hours, generating 7,357,000 kwh and maintenance has amounted to only $42.00."

Write for further information about Nordberg engines, outlining your power requirements.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK IGNITION GAS ENGINES

BUILDERS OF AMERICA'S LARGEST HEAVY DUTY ENGINE LINE . . . 10 to over 12,000 HORSEPOWER

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FRONT COVER ILLUSTRATION

The *Howard E. Simpson*, operated by B. & O. Railroad in N.Y. Harbor, features a 1600 hp Fairbanks-Morse diesel. Exhaust from the stack has not acquired artistic tendencies—the Statue of Liberty was in the background. *Photo by James P. Gallagher.*

ELECTRIC POWER

DELCO-REMY HEAVY-DUTY A.C. GENERATORS

Delco-Remy A.C. generators with companion regulators and rectifiers are the hearts of 12-volt A.C.-D.C. electrical systems designed specifically for modern diesel buses with fluorescent lighting and extra-heavy electrical loads.

Desirable performance characteristics include cut-in at low generator rpm . . . maximum outputs (ranging up to 180 amperes) at low to medium speeds. The new generators supply not only alternating current for fluorescent lights but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

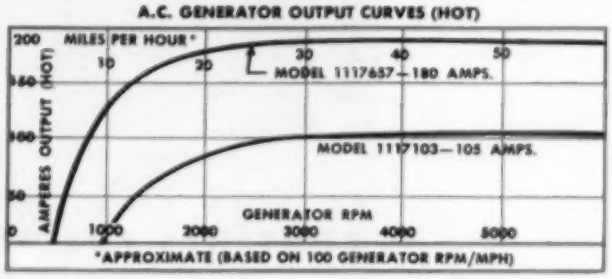
Impressive features of the new generators are their light weight, very high output capacity, and ability to operate over a wide speed range with greatest efficiency. Specify Delco-Remy electrical equipment on your new buses.

A.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-In RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117103	12	960	5	105	1575	All speeds.
1117657	12	550	130	180	2700	All speeds.
1117062-3-4	6	750	38	90	720	All speeds.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

A.C. GENERATOR OUTPUT CURVES (HOT)



DELCO-REMY HEAVY-DUTY D.C. SPLIT-FIELD GENERATOR (120-Ampere Output Capacity)

The Delco-Remy 12-volt split-field generator and its companion regulator are rugged and dependable—designed to meet the needs of diesel transit buses having increased electrical loads coupled with a high percentage of engine idling time.

Desirable performance characteristics include low cut-in, maximum output at less than 1,000 generator rpm. Note performance table at right.

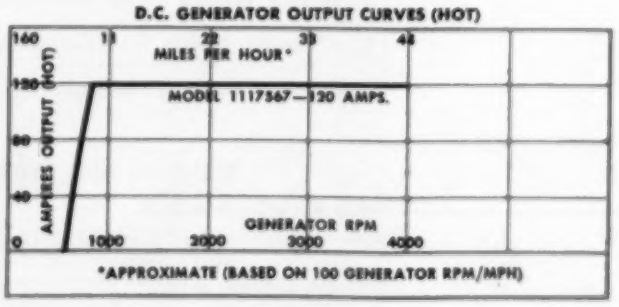
Operating benefits include reduced battery cycling, long battery life, and a simplified electrical system with sustained voltage—at no sacrifice in ruggedness or dependability.

D.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-In RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117567	12	560	120	120	1800	Low speed & idling.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

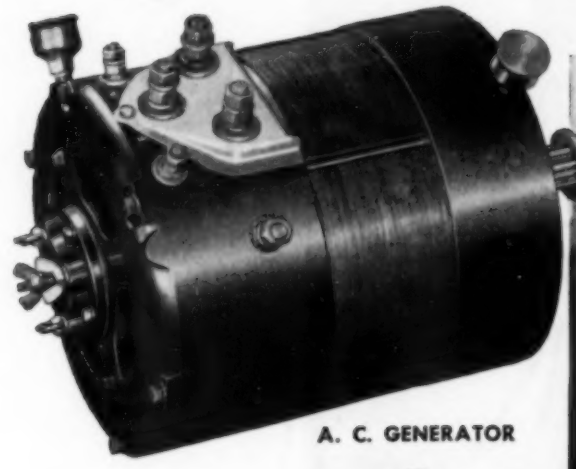
D.C. GENERATOR OUTPUT CURVES (HOT)



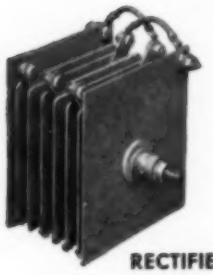
Delco-Remy
ELECTRICAL SYSTEMS

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

right for the job



A. C. GENERATOR



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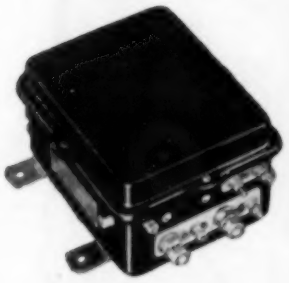
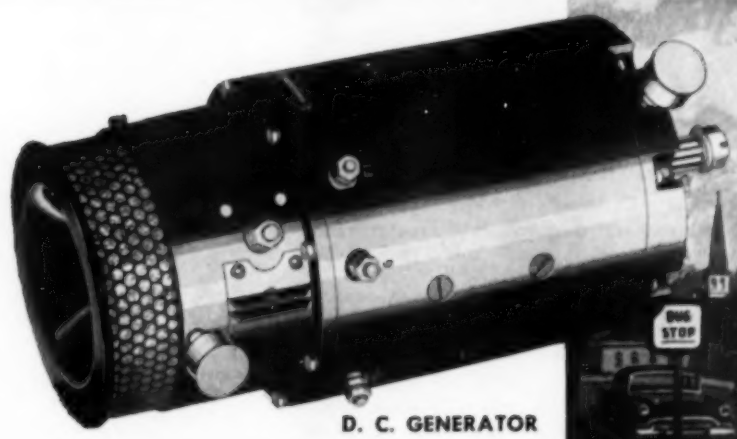
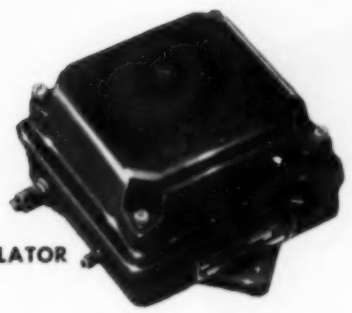


REGULATOR

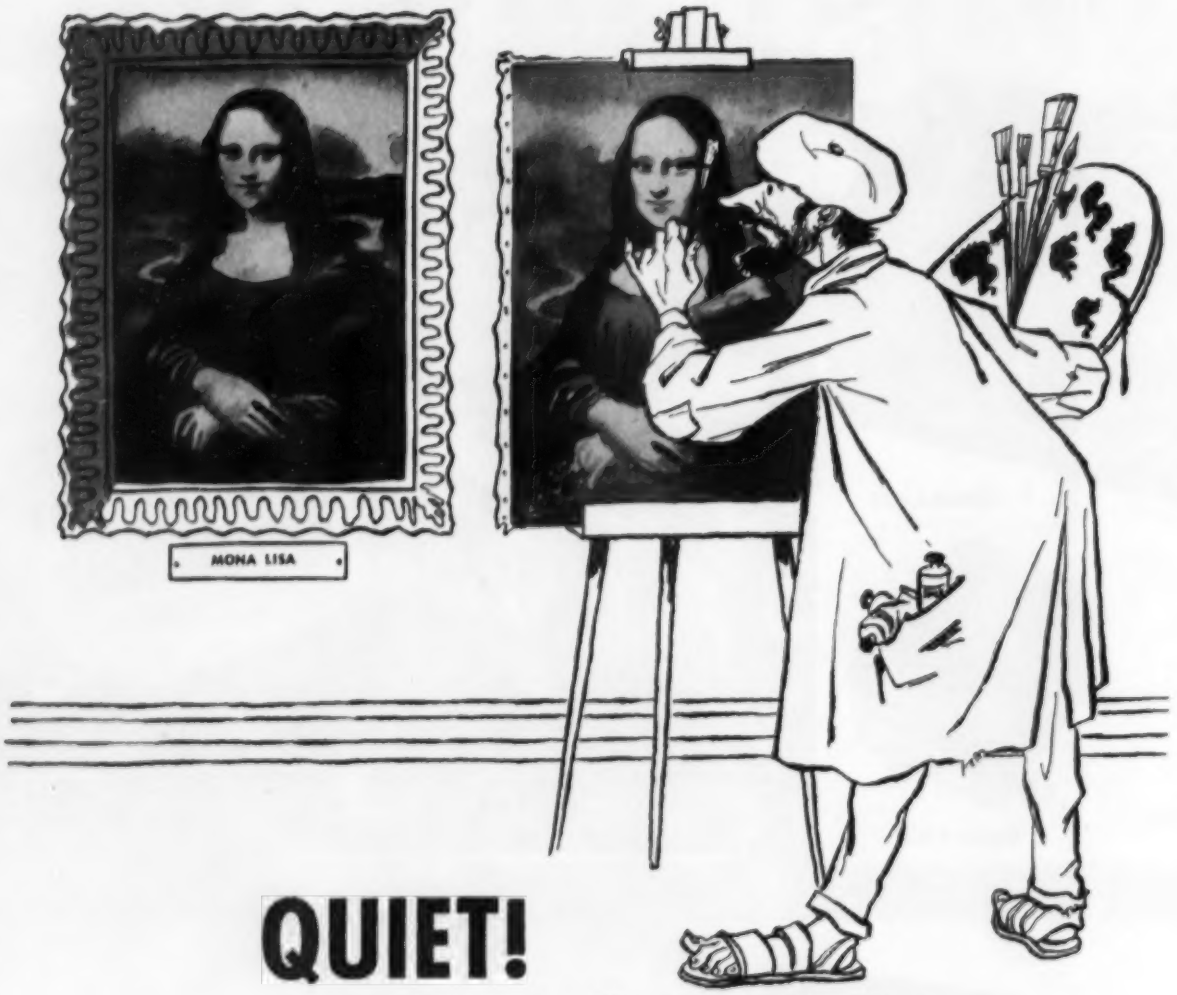


D. C. GENERATOR



REGULATOR

WHEREVER WHEELS TURN OR PROPELLERS SPIN



QUIET!

"Artist" At Work!

HIS brushes and pigments may be top-quality, his training superb, but our enterprising young friend will never come up with anything to compare with the *original* Mona Lisa . . .

It's the same way with C. Lee Cook piston rings and metallic packings. These "masterpieces in metal" are often copied — but never duplicated. And, regrettable as it is, the differences between the copy and the C. Lee Cook "original" can only be discovered the hard way — through untimely shut-downs and frequent, costly maintenance.

If you place a premium on efficient, low-cost operation of engines, pumps and compressors, always insist on genuine C. Lee Cook replacements. On a service basis, they'll always save you money.

C. LEE COOK COMPANY

Sealing Pressures Since 1888

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Don't miss it!

a World's Fair of Power

THE GENERAL MOTORS POWERAMA

Lake Shore—South, Chicago · August 31 through September 25

Here's your chance to mix business with pleasure in a big way.

It's the General Motors Powerama created to celebrate the building of GM's 100,000,000th Diesel horsepower – staged at a fabulous wonderland on Chicago's Lake Front.

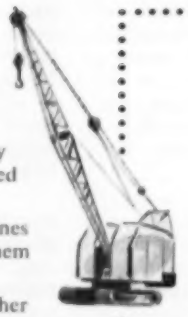
Here you'll see Allison TORQMATIC DRIVES smoothly transmitting Diesel engine power – see why these proved drives make any engine run better, more efficiently.

You'll see a wide range of TORQMATIC-equipped machines in action, watch them speed through their paces, see them change the face of the earth.

You'll watch TORQMATIC-equipped Army tanks and other military vehicles performing breath-taking maneuvers – see twin-jet Scorpions and a sensational VTO interceptor, both powered by Allison aircraft engines.

And here you'll see a brand-new idea in the world of entertainment—the first Technological Circus—"More Power to You"—an amazing combination of circus thrills—vehicular skills and big-time entertainment.

And best of all, *it's all free*. So bring the family – they'll enjoy it just as much as you.



POWERAMA FEATURES

- ★ *Stage show – music, dancers, fun for all*
- ★ *World's newest lightweight train*
- ★ *Diesel-powered boats, tractors, road-building machines*
- ★ *Oil-drilling rigs in action*
- ★ *Mammoth trucks*
- ★ *Scores of Diesel-powered units at work*

GM TORQMATIC

Allison

TORQMATIC DRIVES

Allison Division of General Motors, Indianapolis, Indiana

OWNERS REPORT THE DECISIVE DIFFERENCE IN NEW

TD-18A Performance

"It can self-load and deliver fastest" "International TD-18A improvements like the new 300% stronger track frames and cartridge-type roller seals increase production, machine life, and operating ease. As for power, our new TD-18A can self-load the 8-11 cubic yard scraper and deliver fastest of any crawler we ever had." *Here's proof extra traction matches the TD-18's power increase!* G. W. Owen, McDonough, Ga.

"Every load's a payload" "My TD-18A International Drott is built for the operator's comfort. I know, because I'm the operator. It has 360° visibility which no other loader has. Every load is a payload." *No other outfit built gives you the TD-18's combination of power, visibility and responsive controls.* V. S. Steffes, Owner, Earthmoving and Clearing, Batavia, Illinois.

"Operators fight for new TD-18A!" "The TD-18A's were always good—fast, trouble-free performance and low operating cost made me money. The new model TD-18A is stronger and really planned for the man in the seat. It has operators fighting for it." Big, wide, comfortable cushions; hydraulic steering control boosters, and levers, conveniently grouped on the roomy, non-skid deck! *No wonder TD-18A handling ease turns "skinners" into high-producing operators throughout the day!* M. B. McKee, McKee Construction Co., Chickasha, Oklahoma.

"Uranium search toughest of all!" "I'm in the hardest work I know of—building roads into uranium claims, rim-cutting development work. The TD-18 we used for six years had the motor overhauled after five years, and when we traded a year later the transmission and drives were still original equipment. I believe this heavied-up new model TD-18A is by far the best of all." *Advances like the new bridge-strong welded track frames, stronger transmission and exclusive cartridge-type track roller seals back his judgment.* O. Frost Black, Owner, Blanding, Utah.

Ease into the foam-rubber-padded, panoramic-vision seat and see the *decisive difference*. Try new finger-tip power steering, and other big *job-easing incentives* for boosting production, as developed only by International. Prove TD-18A *full-power traction*—note, too, how the gear train is beefed-up to transmit 103 drawbar hp, and then some! Measure what new *300% stronger track frames* mean *for full-capacity performance* under slam-bang conditions. Compare how new *cartridge-type track roller seals*, and other International *downtime-prevention engineering*, beat anything else on tracks. Ask for a new TD-18A demonstration!

INTERNATIONAL HARVESTER

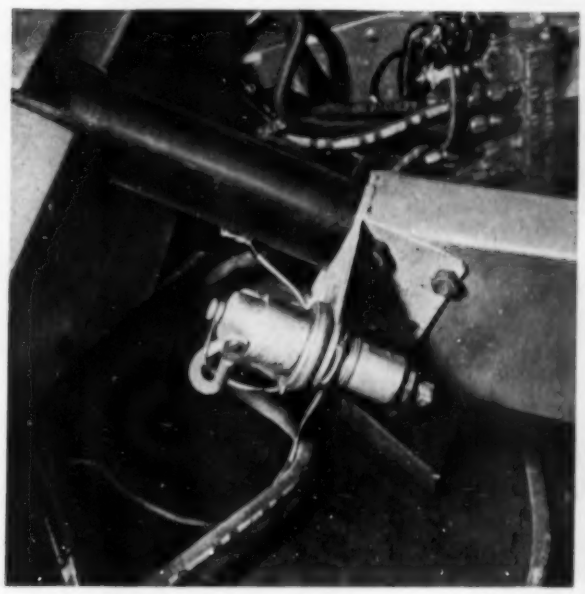
INTERNATIONAL
INDUSTRIAL POWER

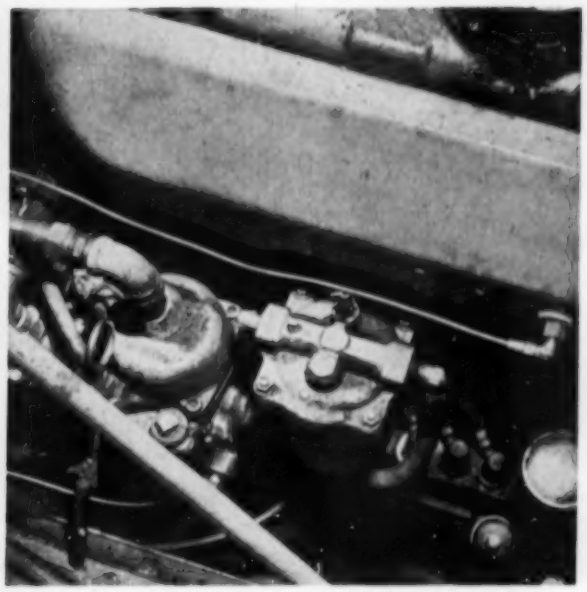
MAKES EVERY LOAD A PAYLOAD

The Engineer's Field Report

CASE HISTORY
PRODUCT Chevron Pressure Primer System
FIRM Consolidated Freightways Inc., Portland, Oregon

Pressure Primer System starts diesels on 1st or 2nd turn with regular batteries—at minus 40°





BELOW ZERO starting temperatures are common 5 months a year for Consolidated Freightways equipment operating in Mountain and Plain States. Two hundred and forty-four of the company's tractors are equipped with the Chevron Pressure Primer System. Since this installation, rigs start on first or second turn at 40° below zero—using regular equipment batteries! Normally in these sub-zero temperatures, regular batteries give out after about 4 turns. Sure starts plus the fact engines are primed with Chevron Pressure Primer bulbs, controlled from within the cab, saves Consolidated Freightways important man-hours and speeds operating schedules. Picture above (left) shows a Chevron Pressure Primer Discharger mounted on steering column. Highly volatile priming fuel is atomized through tubing into manifold (right) under 250 lbs. pressure.

FREE FOLDER tells you more about Chevron Pressure Primer System and how to install it on different engines. Write or ask for it today.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies listed below.

CHEVRON

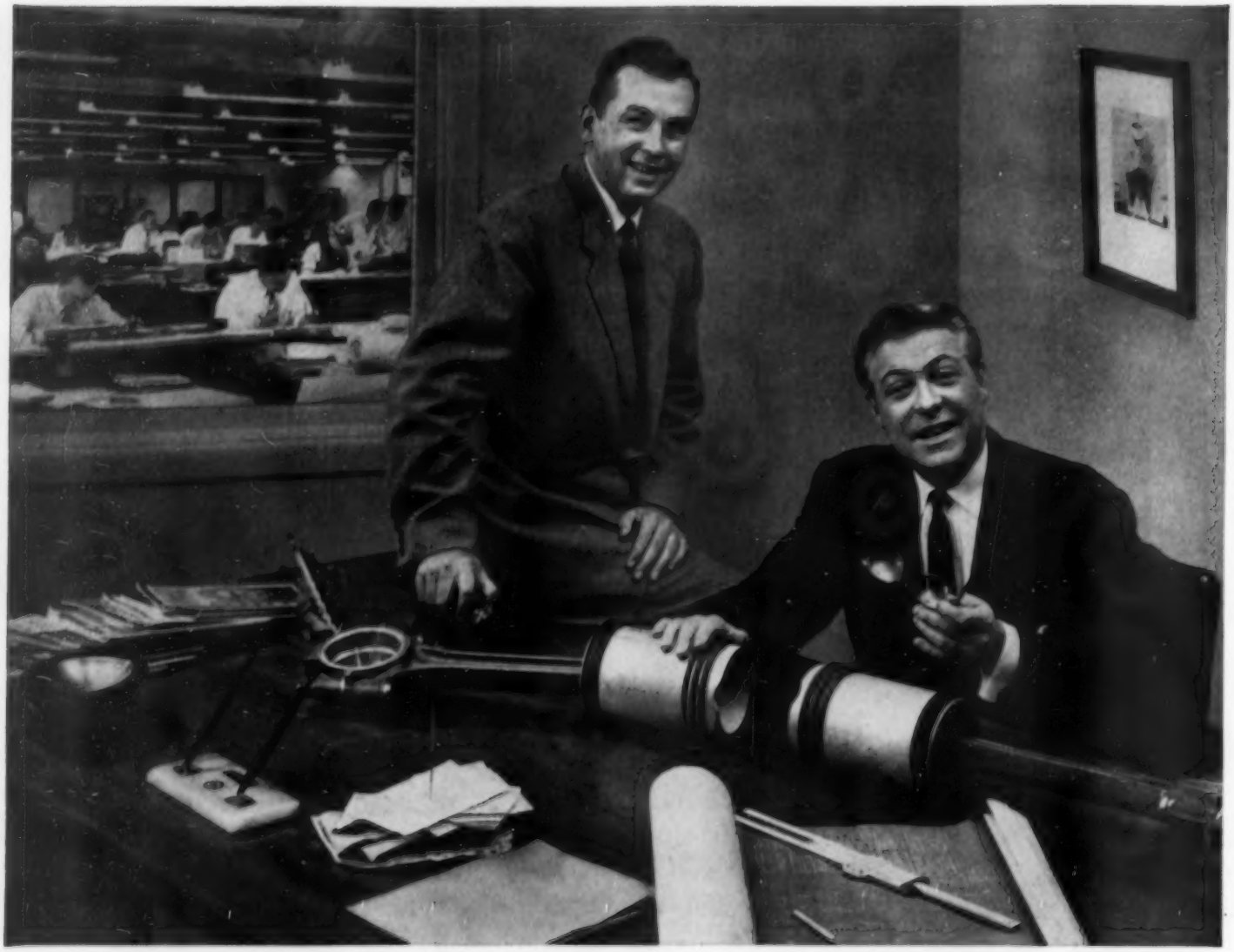
TRADEMARK "CHEVRON" REG. U. S. PAT. OFF.

Why Chevron Pressure Primer System helps starting

Volatile Chevron Priming Fuel atomizes in induction system at temperatures as low as -65°F. Pressure or weakest spark from engine fires mixture.

Simple, rugged discharger prevents fuel leakage. Small, safe steel bulbs protect fuel from water and dirt.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado



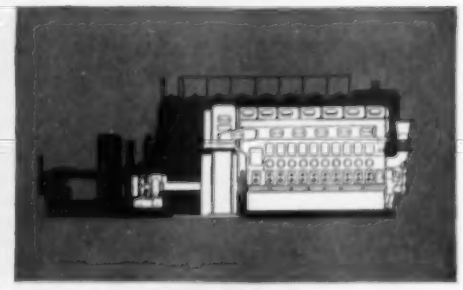
They were asked, "Why two when one will do?"

That's often the first reaction to the Fairbanks-Morse Opposed Piston Diesel . . . "Why two pistons?"

The answer given by the F-M Diesel Design Staff is quite simple: two pistons reacting to the forces of combustion in a common cylinder give you greater horsepower per cylinder . . . more power per foot of floor space . . . far less vibration, and, as it happens, a far more simple engine with 40% fewer moving parts to wear and maintain.

Only from Fairbanks-Morse can you get such originality and soundness of *new* design that assure outstanding performance. When next you need a Diesel Engine . . . or a scale . . . an electric motor . . . or a pump, look for the famous F-M Seal and see the difference that quality makes. Fairbanks, Morse & Co., Chicago 5, Illinois.

The Secret is this cylinder liner that contains two pistons. It eliminates cylinder heads and their gasketed joints, intricate valve trains and their timing—all parts that require skilled maintenance.

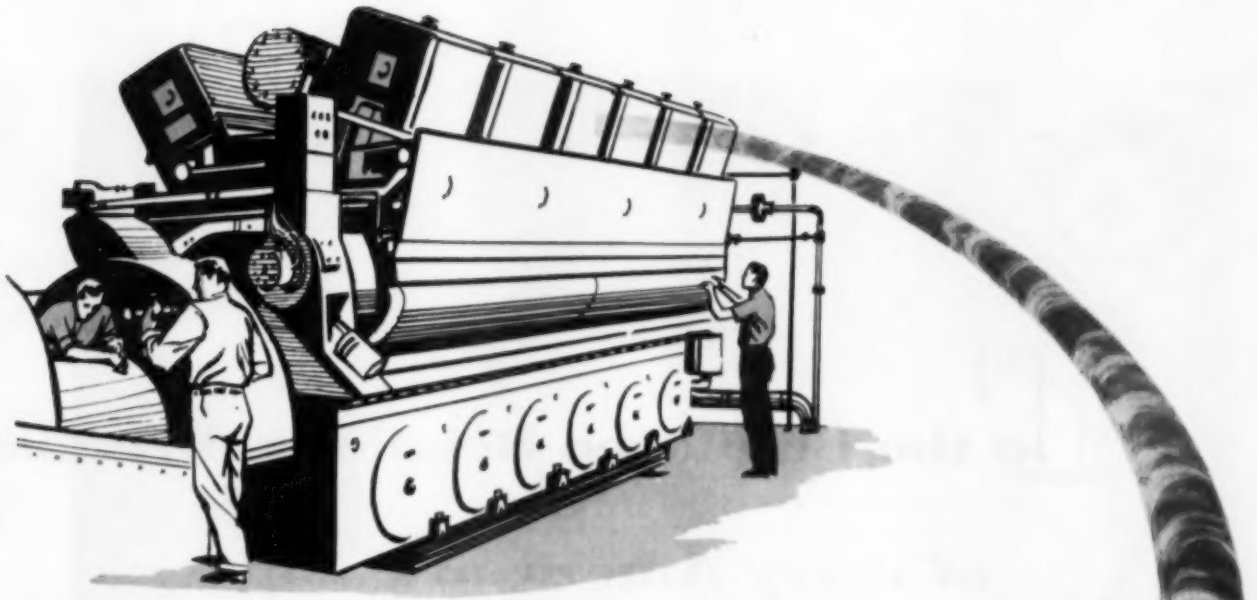


The Result is a compact, lightweight diesel that permits installing *more* horsepower in the *same* space occupied by any other comparable engine. And horsepower for horsepower, the O-P is the easiest to maintain.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS



BOOST DIESEL OUTPUT

with less fuel...less noise...less smoke

AiResearch Turbochargers give your stationary or mobile diesels more added horsepower than any comparable turbocharger or supercharger installation!

The application of AiResearch Turbochargers to stationary diesel equipment will overcome excessive noise and smoke problems... jump horsepower to a much higher level... and cut your fuel bills on a horsepower per hour basis.

In addition, it will restore operating efficiency for your diesel power plants at altitude.

Application of these finely engineered power packages to mobile diesel equipment is equally effective... as has already been demonstrated in the remarkable results achieved by the installation of AiResearch Turbochargers on Caterpillar diesel machinery.

AiResearch is the largest producer of small turbomachinery in the United States, with twenty-five *million* hours of experience. This unmatched experience explains why AiResearch Turbochargers lead in power, economy and dependability. Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

To the Employee Relations Director of every American company

LET'S FACE IT . . . the threat of war and the atom bomb has become a real part of our life—and will be with us for years. Fires, tornadoes and other disasters, too, may strike without warning.

The very lives of your employees are at stake. Yours is a grave responsibility. Consider what may happen.

When the emergency comes, everybody's going to need help at the same time. It may be hours before outside aid reaches you. The best chance of survival for your workers—and the fastest way to get back into production—is to know what to do and be ready to do it. To be unprepared is to gamble with human lives. Disaster may happen TOMORROW. Insist that these simple precautions are taken TODAY:

☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's entirely integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here again, your CD Director can help—with advice on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First Aid Training Courses.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good employee relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . before it's too late.

SPACE FOR THIS **CIVIL DEFENSE** MESSAGE CONTRIBUTED BY

R. H. Wadman

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

higher loads...
economy fuels...
new
engine designs...

there's one answer for all three of these lubrication problems—

STANODIESEL OIL M

Demands upon the lubricant in stationary industrial engines are increasing. More severe operating conditions caused by heavier loads, new engine designs and the use of economy fuels pose difficult lubrication problems not met by conventional oils. Standard Oil Company introduces a lubricant specifically designed to meet these problems—STANODIESEL Oil M.

STANODIESEL Oil M meets or exceeds the requirements of a lubricant for stationary industrial engines. Here's why:

STANODIESEL Oil M is refined from the highest quality base stock. It has superior stability.

Special additives are blended with this STANODIESEL Oil M base stock. An oxidation inhibitor prevents unwanted increases in oil viscosity and prevents corrosion of bearings. The action of detergent-dispersant additives keeps crankcase, pistons, cylinder walls and other parts clean. Contaminants are kept in suspension and are prevented from depositing. An anti-foam agent makes this oil suitable for use in hydraulic governors. A wetting agent increases the oil's ability to reach and maintain a film on such highly stressed parts as cams and cam followers.

Use of STANODIESEL Oil M means this: less engine deposits, less ring and cylinder wear. Less spark plug fouling when used in gas engines. Eliminates fuel injector and pump sticking caused by deposits on the injector barrel and plunger when fuel and lubricating oil commingle.

You need to know about STANODIESEL Oil M. In the Midwest, call your nearby Standard Oil lubrication specialist. You will receive the information promptly. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY (Indiana)

GENERAL MOTORS **powerama**

Lake Shore Drive next to Soldier Field
Chicago — Aug. 31 through Sept. 25

Railroad history may start a new chapter when the Electro-Motive Division presents General Motors' concept of the train that can put the railroads in a strong new competitive position in the passenger field.

Plan *now* to see how revolutionary new design and Air Suspension springing will put new scheduled speed, a new concept of comfort and striking economies behind the railroads' bid for travel business.

See, too, the revolutionary Frigifrator—Mobile Power Cars and Trailer—a real oil drilling rig in action—the rebirth of a locomotive—dozens of fascinating exhibits, all part of the tremendous spectacle of the Powerama.

This celebration of General Motors' 100 Millionth Diesel Horsepower will be literally a World's Fair of Power. Acres of absorbing demonstrations will give "sidewalk superintendents" ringside seats as mechanical monsters show their abilities.

And there's a great outdoor stage show—music—dancers—spectacular acts built around behemoth machinery—jet plane formation flying—a vertical-take-off plane in action—really a host of thrilling, informative sights you shouldn't miss.

Start making arrangements now to see the GM Powerama.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
LA GRANGE, ILLINOIS

WORLD'S LARGEST . . .
and a perfect TARGET for DUST!

Twelve Type W Cycoils clean scavenging air for six 1600-hp. diesels (shown in inset) at Station 5-A—world's largest low-lift pump plant located midway between Lake Okeechobee and West Palm Beach, Fla.

New Florida Pumping Station "Plays it Safe" by Installing Cycoil Oil Bath Air Filters

Everything about Station 5-A is "big". Its six pumps have a daily capacity of over 3 billion gallons—that's three times the daily water consumption of New York City. Powering these pumps are six 1600-hp. Fairbanks-Morse Diesels. Their combined job—to protect Florida against rampaging floods and devastating droughts through year 'round control of Lake Okeechobee.

Recognizing the importance of this operation, action was taken to insure that dust will never become "a monkey wrench in the machinery". Two Type W Cycoils placed at air intake of each of the six Diesels guarantee freedom from dust damage. Two-way cleaning action of these oil bath filters leaves nothing to chance. Thorough mixing of oil with intake air traps 90% of the dust content. The remaining 10% falls easy prey to Cycoil's filter pads.

Cycoil's complete protection costs but a fraction of a major shutdown to repair the damages of dust. For complete product information, write for Cycoil Bulletin 130.

AAF herman nelson

American Air Filter
COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 408 Central Avenue, Louisville 8, Kentucky

WHITLEY COLLINS — *Portrait by Fabian Bachrach*

"Over 80% of Northrop personnel buy U.S. Savings Bonds . . ."

"Our recent Payroll Savings Campaign at Northrop demonstrated the belief of our personnel and our company in the basic fundamentals of American good citizenship—staunch support of our Country and personal thrift.

"At the completion of the campaign we had over 17,000 regular savers—over 80% of all Northrop personnel buying U. S. Savings Bonds regularly on the Payroll Savings Plan. Every employer should stage a similar campaign for the benefit of his personnel and the economic welfare of our Country."

WHITLEY COLLINS, ***President***
Northrop Aircraft Company

If less than 60% of your personnel are Payroll Savers, do something about it. A phone call, telegram or letter to Savings Bonds Division, U. S. Treasury Department, Washington, D. C., will bring prompt assistance from your State Director. He will help you install, or revitalize a Payroll Savings Plan, through a simple, person-to-person canvass which your personnel will be glad to conduct. That's all you have to do—your men and women will do the rest.

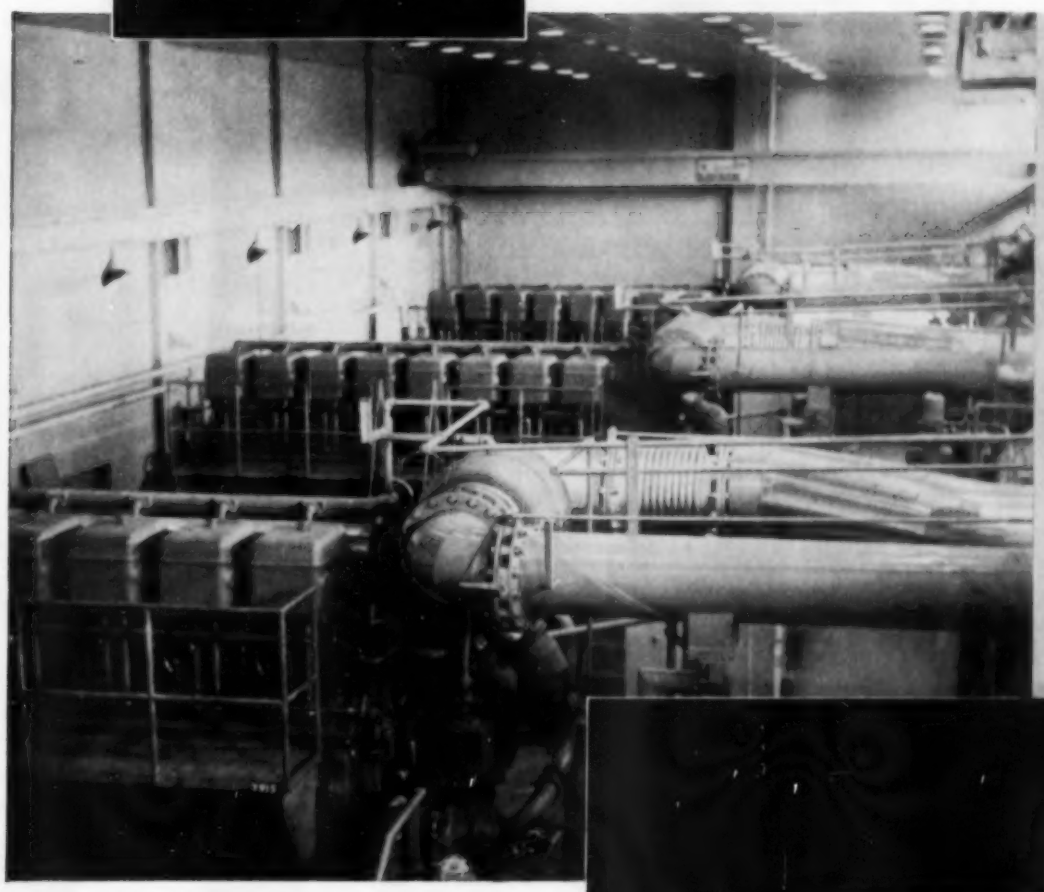
The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

Robert E. Kadrmas

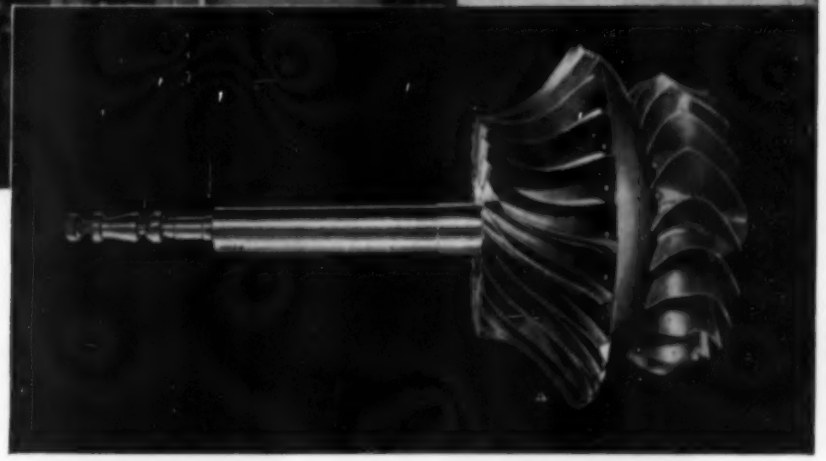
Editor—DIESEL PROGRESS

DE LAVAL
HIGH PRESSURE TURBOCHARGERS

efficiently serve diesels at Lakehead Pipe Line Company



Exclusive
MONOROTOR
Construction



Located in an outlying district in Northern Minnesota, this oil pumping station of the Lakehead Pipe Line Company must have *dependable, efficient* equipment. That's why Nordberg Diesel engines *with De Laval High Pressure Turbochargers* were chosen for this service.

The De Laval turbochargers efficiently utilize the exhaust gases to supply the high intake air requirements of these 1800 BHP, eight cylinder, four-cycle Supairthermal engines. Shown in the photograph are three units. Six other identical engines operate in pairs in three other stations of this company.

Due to the exclusive Monorotor design, De Laval High Pressure Turbochargers have a pressure ratio up to 3:1, as well as far higher pressure and turbine efficiencies than those found in conventional turbocharger systems. They are self-adjusting to engine loads, can be used with 4- *and* 2-cycle engines.

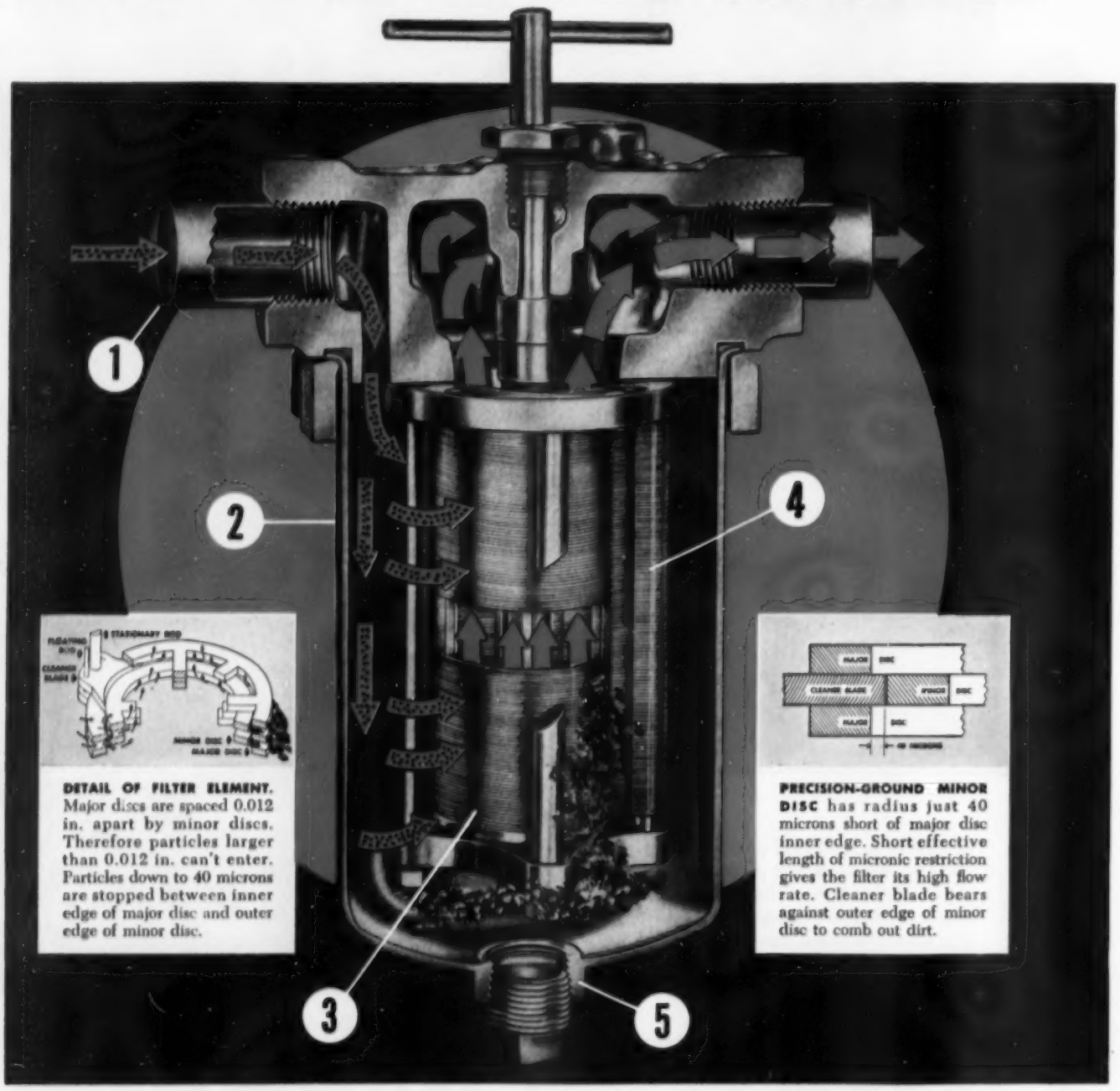
Write for De Laval Bulletin 8000 giving comprehensive curves and flow range diagrams.

DE LAVAL *Turbochargers*

DE LAVAL STEAM TURBINE COMPANY
883 Nottingham Way, Trenton 2, New Jersey

DL 324

New CUNO 40-micron


1
2
3
4
5
DETAIL OF FILTER ELEMENT. Major discs are spaced 0.012 in. apart by minor discs. Therefore particles larger than 0.012 in. can't enter. Particles down to 40 microns are stopped between inner edge of major disc and outer edge of minor disc.
PRECISION-GROUND MINOR DISC has radius just 40 microns short of major disc inner edge. Short effective length of micronic restriction gives the filter its high flow rate. Cleaner blade bears against outer edge of minor disc to comb out dirt.

CUTAWAY OF NEW SUPER AUTO-KLEAN. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal-edge filter (3) of stacked major and minor discs. Trapped dirt is combed out by cleaner blades (4) when discs are rotated and is removed through drain (5). Clean oil rises through center of filter element, leaves at right.

self-cleaning filter!

THE *Super* AUTO-KLEAN

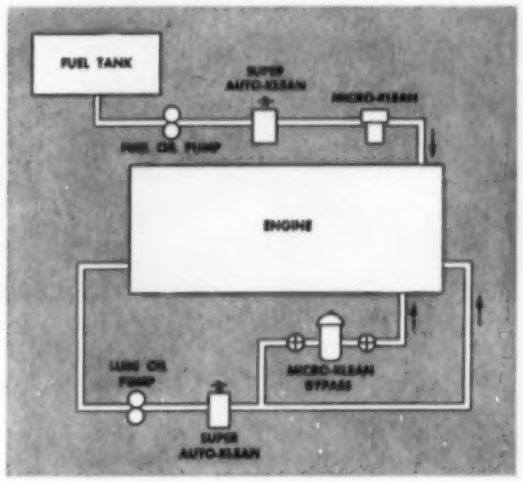
FOR FULL-FLOW LUBE AND FUEL

. . . and you can clean this filter by simply turning the handle!

Cuno's new Super AUTO-KLEAN filter now makes possible economical, compact full-flow micronic filtration for small high-speed diesels, and requires no more space than present bypass filters. Super AUTO-KLEAN makes full-flow filtration on large low-speed diesels more economical than ever before. Here's what it offers:

1. Full-flow micronic filtering with a self-cleaning filter. Filter can be cleaned continuously with motor drive or intermittently by manually turning handle.
2. Eliminates cartridge changes.
3. No pressure drop build-up (saves pumping horsepower). An 8-in. long, 2¾-in. diameter cartridge handles 25 gpm of lube oil of 200 SSU viscosity with only 3 psi pressure drop—up to 75% more with slightly higher pressure drop.
4. Positive engine protection against particles larger than 40 microns (actually 0.0015 in.). Filter can't rupture or channel.
5. No need to use large, expensive, high-maintenance cartridge filters. Oil can be kept in top shape with small, inexpensive bypass CUNO MICRO-KLEAN filter to remove particles smaller than 40 microns. Bypass cartridge lasts longer because it's not clogged with particles larger than 40 microns.
6. No duplex units needed. Super AUTO-KLEAN handles full flow all the time with no interruptions for cleaning.
7. Can't absorb or adsorb additives from the oil because it's all metal.
8. Uses standard AUTO-KLEAN housing on existing AUTO-KLEAN installations. You can easily replace most 2¾-in. diameter cartridges with Super AUTO-KLEAN for finer filtration.
9. Can be adapted to any existing engine. Simply install Super AUTO-KLEAN in the full-flow lube oil line following the discharge of the engine pump.
10. Gives lower initial costs, lower installation costs, requires less space than cartridge-type full-flow units. You get high capacity in a small package.

Send coupon for complete information on the new Super AUTO-KLEAN filter for your new or existing diesels. Cuno Engineering Corporation, Dept. 8151, South Vine Street, Meriden, Conn.



SIMPLIFIED SET-UP for ideal lube oil filtration. Full flow goes through Super AUTO-KLEAN and is cleaned of particles 40 microns and larger on every pass. A CUNO MICRO-KLEAN replaceable-cartridge filter may be used where conditions warrant further clarification. Various element densities available to remove particles down to one micron. Housings available for either partial flow (as shown above) or full-flow hook-ups.

5.1

MAIL COUPON FOR COMPLETE INFORMATION

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids from More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge)
FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)

CUNO ENGINEERING CORPORATION
Department 8151
South Vine Street, Meriden, Conn.

Please send me full data on the NEW Cuno Super AUTO-KLEAN filter.

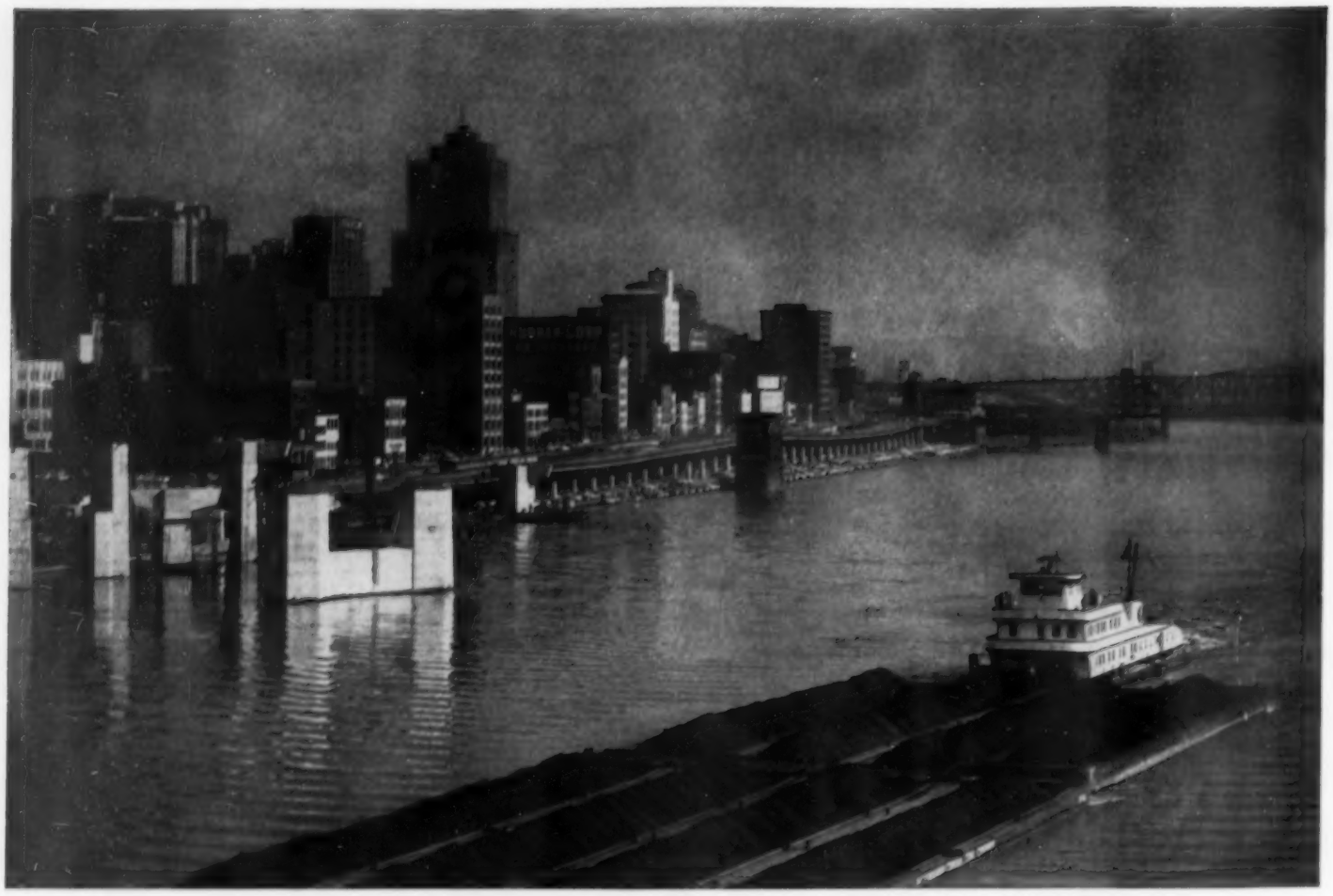
Name_____

Firm_____

Position_____

Address_____

City_____ Zone_____ State_____



The towboat, *Crane*, is shown pushing loaded coal barges into the Ohio River at Pittsburgh on the way to Ohio Valley Electric Company's Kyger Creek Power Plant. St. Louis Shipbuilding Company built the *Crane* and sister ships *Mike Creditor* and *A. L. Long*.

Ohio River Company calls for more when

Baldwin Diesel power proves efficient on M/V "A. H. Crane"

Performance of twin Baldwin Diesels on their M/V *A. H. Crane* showed Ohio River Company that Baldwin Diesel power is efficient, dependable, economical. They came back for more. Now the *Crane's* Baldwins are duplicated on the *Mike Creditor* (commissioned in February) and the *A. L. Long* (commissioned in June).

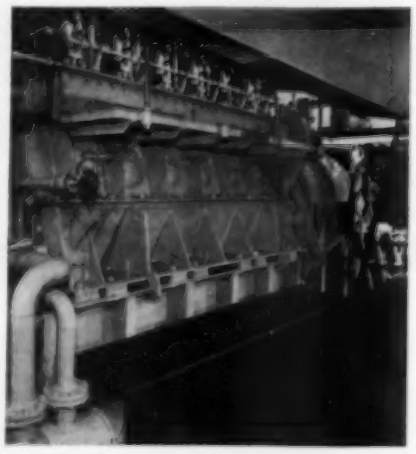
The *Crane* easily handles tows equivalent to 360 fifty-ton railroad coal cars (twenty 1000-ton barges) at a minimum fuel cost. Maintenance has been no problem at all.

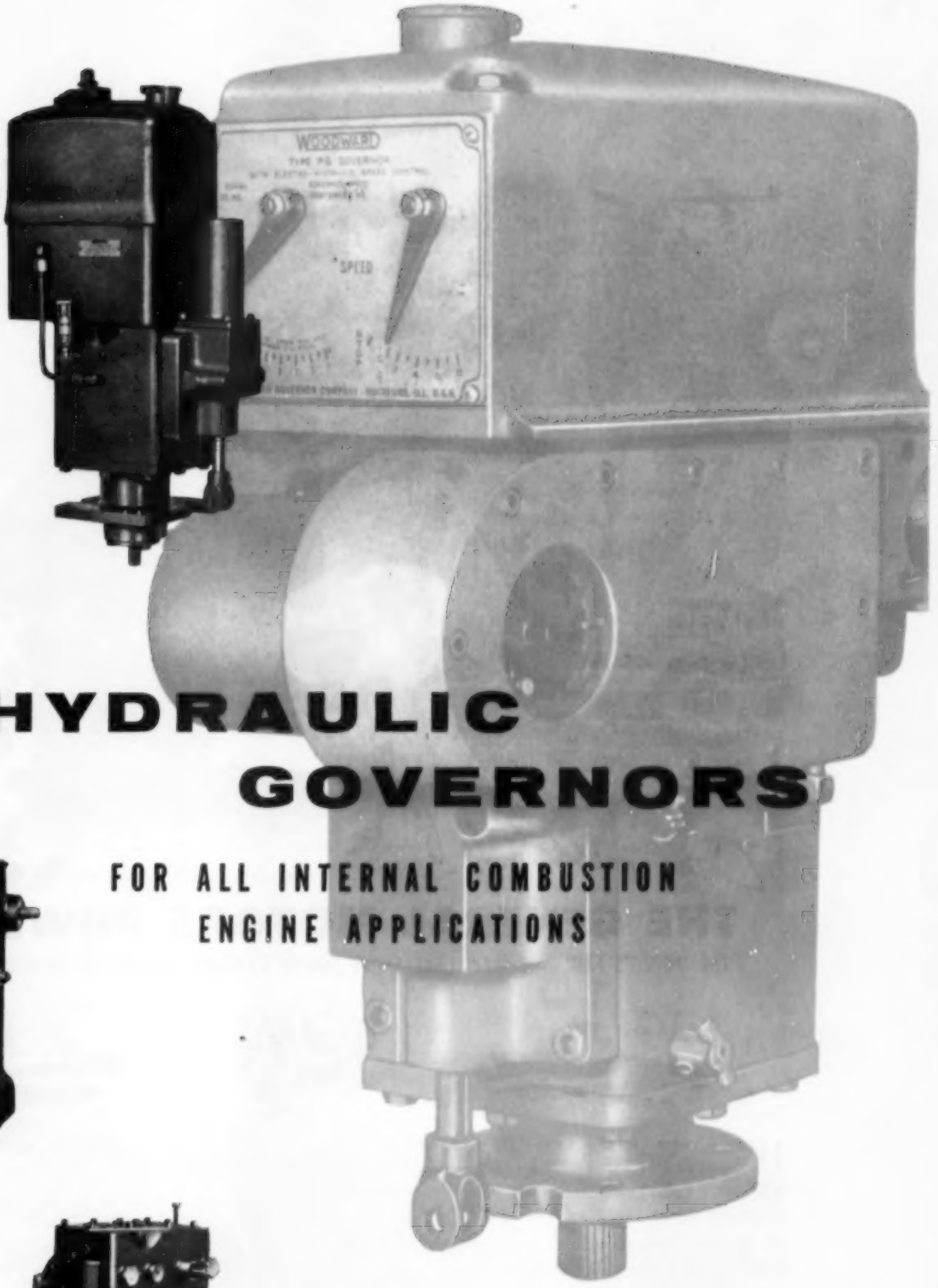
Find out how *you* can tow more, spend less with Baldwin Diesel power. Write us today for complete details!

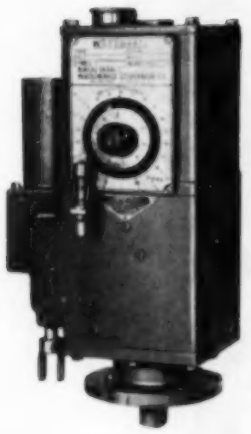
Hamilton Division

BALDWIN-LIMA-HAMILTON

The Crane's two 6-cylinder, 4-cycle, 12¾ x 15½ turbocharged Baldwin Diesels each develop 1080 hp at 625 rpm. Their low weight per horsepower, rugged construction and high efficiency over a wide range of output make possible constant peak performance at low operating cost with minimum maintenance.

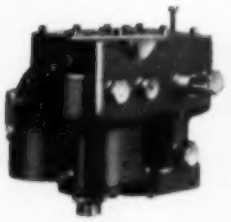






HYDRAULIC GOVERNORS

FOR ALL INTERNAL COMBUSTION ENGINE APPLICATIONS



WOODWARD GOVERNOR COMPANY

ROCKFORD, ILLINOIS

WORLD'S OLDEST AND LARGEST
MANUFACTURER OF HYDRAULIC GOVERNORS
FOR PRIME MOVERS

THE GENERAL MOTORS POWERAMA

THE WORLD'S FAIR OF POWER—LAKE SHORE SOUTH, CHICAGO—AUGUST 31 THROUGH SEPTEMBER 25

HERE'S YOUR CHANCE to see for yourself the great General Motors turbocharged 2-cycle, 16-cylinder, 4500-hp. engine—and to inspect the latest GM Diesel developments.

It's the General Motors Powerama created to celebrate the building of GM's 100,000,000th Diesel horsepower—staged at a fabulous wonderland on Chicago's Lake Front.

Here you'll inspect a GM Diesel-powered submarine, look over the largest GM Diesel-powered tug on the Great Lakes.

And here you'll see a brand-new idea in the world of entertainment—the first Technological Circus—"More Power to You"—an amazing combination of circus thrills—eye-opening vehicular skills and dazzling entertainment.

And best of all, *it's all free.* So bring the family—they'll enjoy it just as much as you.

POWERAMA FEATURES

- Stage Show—music, dancers, fun for all
- World's newest lightweight train
- Diesel-powered boats, tractors, road-building machines
- Oil-drilling rigs in action
- Mammoth trucks
- Scores of Diesel-powered units at work

GM CLEVELAND DIESEL

CLEVELAND DIESEL ENGINE DIVISION

General Motors • Cleveland 11, Ohio

The MODERN Southern Pacific uses the MODERN Diesel lubricant

GULF DIESELMOTIVE OIL

104 YEARS AGO a small wood-burning locomotive forged the first link in what is now the gigantic Southern Pacific transportation system. Today powerful Diesels thunder over the maze of rails that make up this modern system which serves eight Western and Southwestern states.

Throughout the territory served by a subsidiary, the Texas and New Orleans Railroad, Southern Pacific Diesels are lubricated with Gulf Dieselmotive Oil. This modern Diesel lubricant contributes to better performance, greater availability, and lower maintenance costs on many of our nation's leading railroads.

here's why:

1. Effective detergent action prevents harmful piston ring belt deposits.
2. Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.
3. 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

Gulf Sales Engineers, experienced in railroad Diesel operation, are always available to aid you in maintaining high standards of lubrication throughout your system. Consult the telephone directory for the number of your local Gulf office.

GULF OIL CORPORATION • GULF REFINING COMPANY

1822 Gulf Building, Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

COMPARE

INSTALL JUST ONE SET OF DaRoS PISTON RINGS IN YOUR EQUIPMENT AND DISCOVER THE BIG DIFFERENCE

DaRoS Piston Rings are *not* ordinary rings! Made of Swedish Charcoal Iron, they have a lower rate-of-wear than other rings. Wear on cylinders is less, too. That means less "down-time" for your equipment—thousands of more operating hours between ring renewals and cylinder reconditioning!

What's more, DaRoS Rings do *not* leak. They maintain complete efficiency in either new or worn cylinders—resulting in big fuel savings! You actually save 10% to 15% on fuel costs.

Discover the *big* difference DaRoS Piston Rings can make in your equipment. Just one installation will convince you. Write, wire or phone for recommended application and prices now.

IMMEDIATE DELIVERY FROM CHICAGO on all Popular Sizes

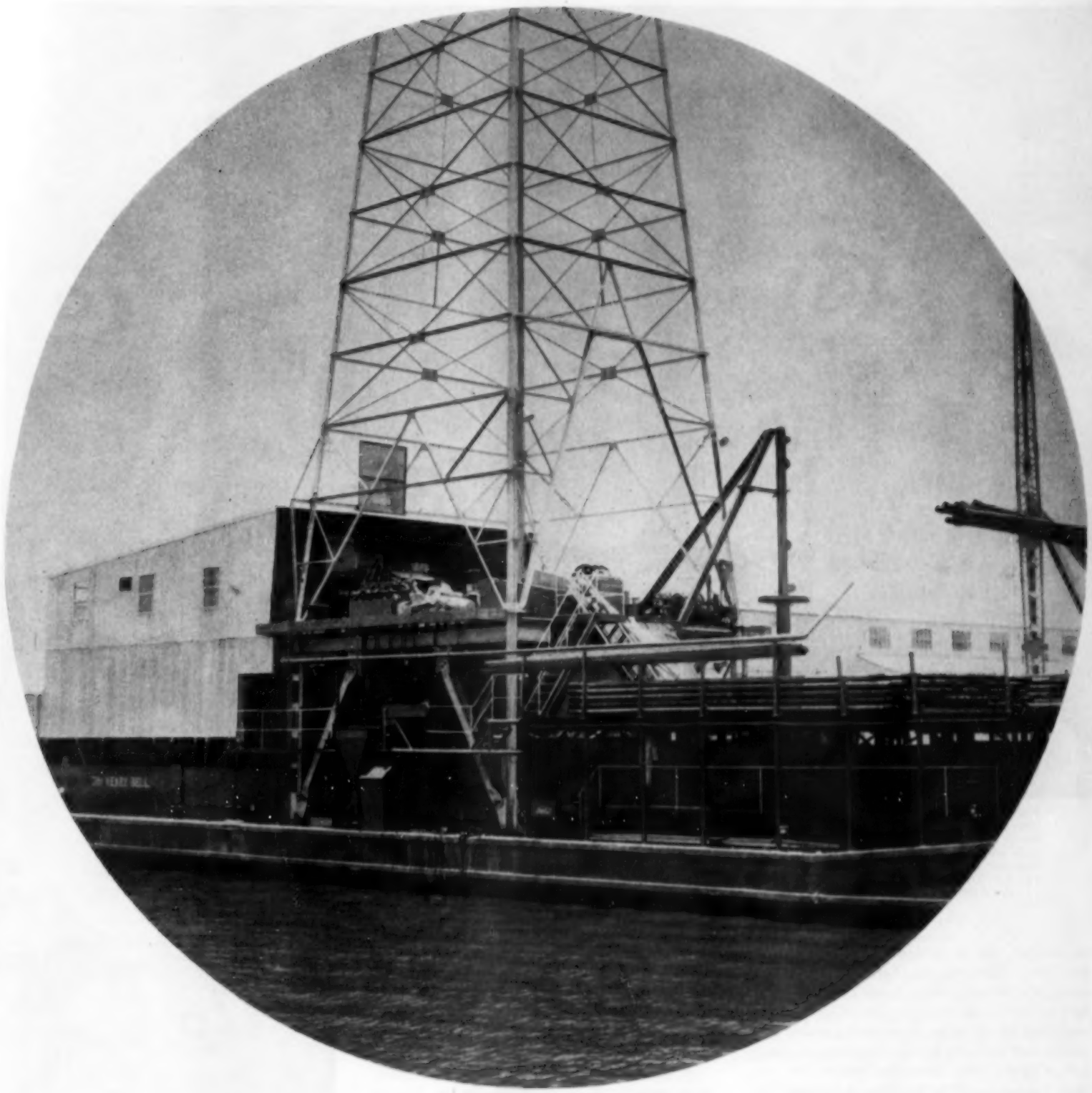
(This is ad #7 in a series designed to tell Diesel Operators the important story about DaRoS Swedish Iron Piston Rings.)

DaRoS AMERICAN CORPORATION

D. D. Cook, President

8128 N. LAWNDALE AVENUE • SKOKIE (Chicago Suburb), ILLINOIS, U.S.A.

Distributors for North, Central and South America

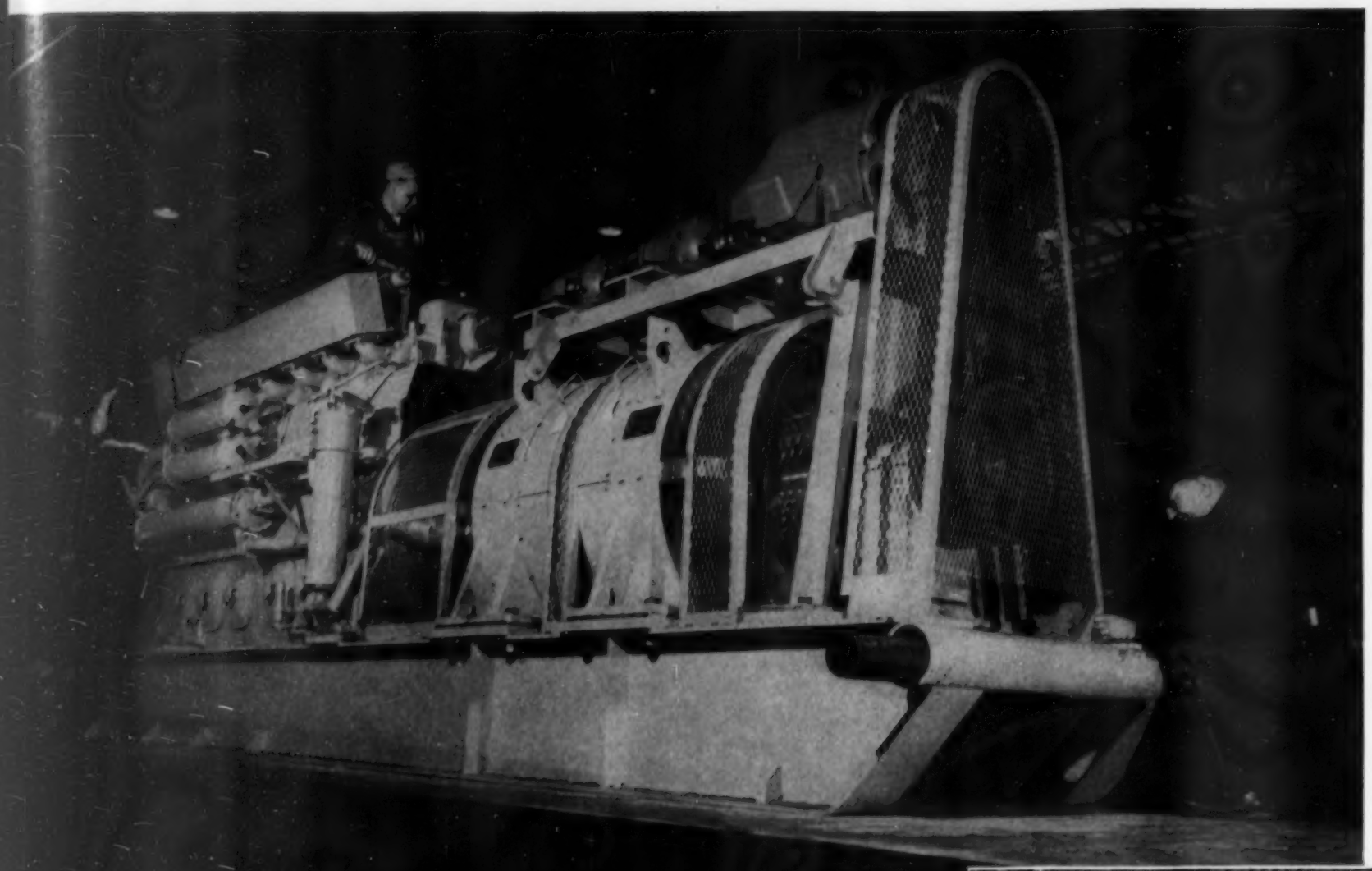


ALCO DIESEL-ELECTRIC DRILLING RIG

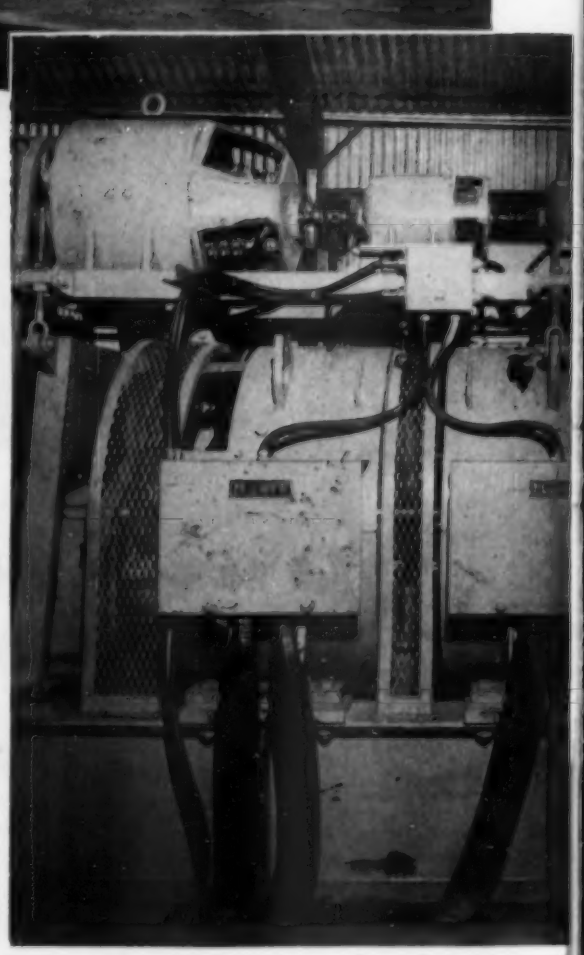
By JAMES W. CALVERT

IN his less affluent days during the East Texas oil boom, independent oilman Earl Bateman's banker and confidant was the late Henry Bell of Tyler, Texas. Now one of the nation's leading oil producers, Mr. Bateman recently took delivery of a new drilling barge for his extensive marsh operations. He named his modern drilling rig the *Henry Bell*, in tribute to his early backer. The widow, Mrs. Henry Bell of Tyler, christened the barge in colorful ceremonies at the Harvey, La., plant of the Hunt Tool Co., which built the 180-ft. vessel for Bateman Drilling Co.

In contrast to the more fabulous deep water drilling barges designed for operation in the offshore oil fields of Louisiana and Texas, the *Henry Bell* has a depth of 10 ft. 8 in. and is intended for operating in shallow waters of the marshland oilfields, located in the bays and bayous of the Gulf Coast. What makes the *Henry Bell* unique, however, is its one-package diesel-electric power plant, the first to



This is the compact diesel-electric power package announced in November 1954 by Alco Products—one of two such units installed aboard the *Henry Bell* for marshland oil drilling. One of the Elliott generators shown is rated 500 kw, the other 400 kw.



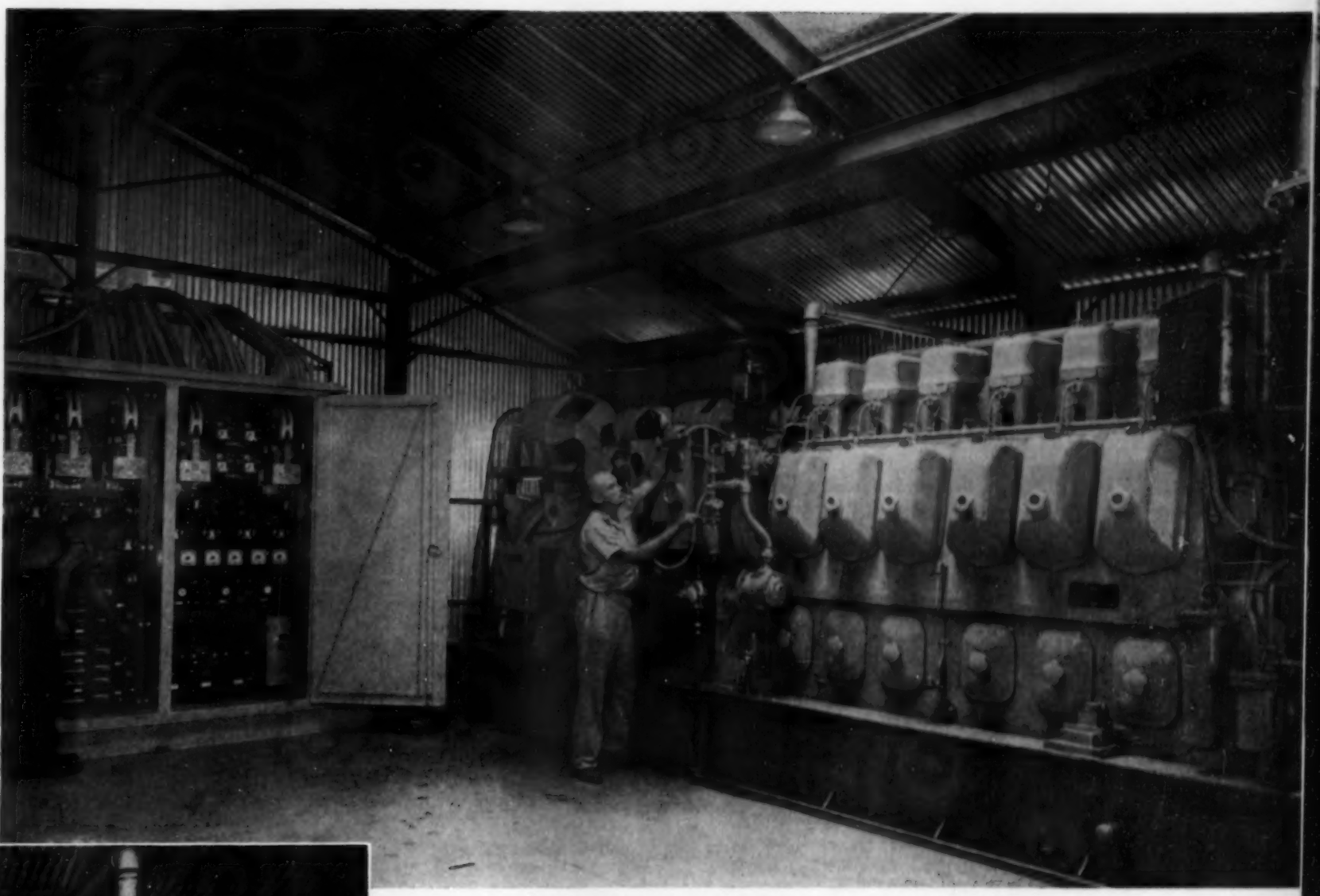
An employee of the Bateman Drilling Co. adjusts the Woodward governor on one of the Alco diesels. To his left are the two main Elliott generators, exciters, and the auxiliary generator (top left) of one engine set.

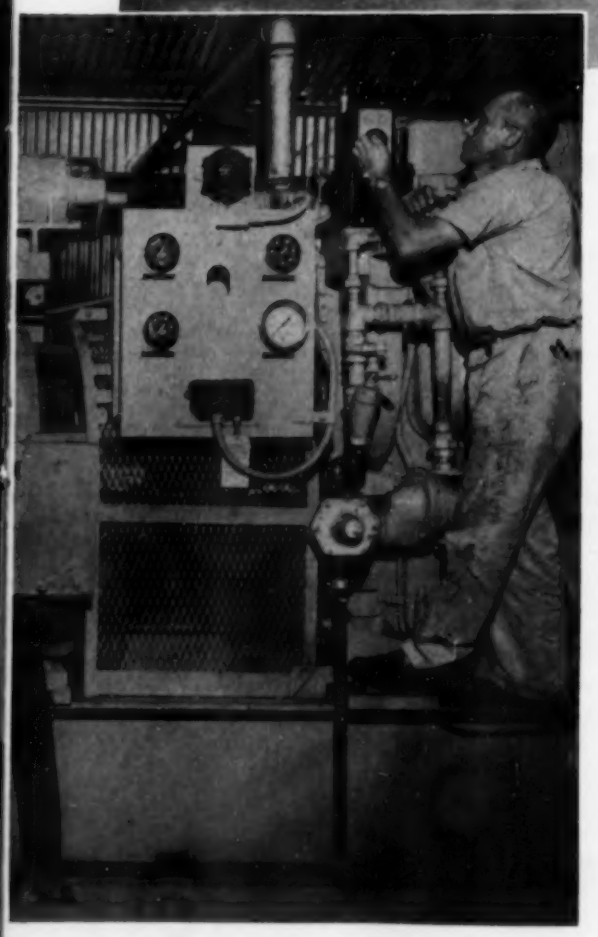
be designed for oil field use by the Alco Products, Inc. (formerly the American Locomotive Company). While a diesel-electric operation is not new to the oil industry, the idea of a single unit supplying power to the draw works, rotary, mud pumps and auxiliary services, is a distinct contribution by the diesel locomotive builders who long since have mastered the problems of building maximum power into small, compact assemblies.

The Alco drilling unit consists of two skid-mounted generator sets, each consisting of an Alco Model 251 diesel engine, two 1000 rpm generators and one 50 kw, 125 volt dc auxiliary generator—belt driven from the main generator shaft. Each engine develops 850 hp at 1000 rpm. Each is a 6-cylinder, 4-cycle, turbocharged unit, with 9 in. bore and 10½ in. stroke. Cylinder liners and heads are water cooled, and pistons are oil-cooled. A belt-driven fuel booster pump provides a constant supply of filtered fuel oil to the injection pumps, and each cylinder has individual fuel injection pumps. Automatic audible and visible alarms indicate low oil pressure in the lubricating system. Oil cooler, filters, strainers and pressure regulating valve are mounted on the engine. A gear-driven centrifugal pump circulates cooling water through the engine and the lubricating oil cooler. Engine starting is provided by an air motor operating on a maximum air pressure of 150 psi.

Generators consist of an Elliott 500 kw 250 volt differential field generator for one mud pump motor and a 400 kw, 250 volt Elliott generator for one drawworks motor, both mounted on a skid with each diesel engine. In addition, there are two 50 kw, 125 volt Elliott auxiliary generators to supply all auxiliary power for the entire rig, such as lighting, cooking, and air conditioning.

The draw works assembly has two 500 hp, 600 rpm Elliott shunt field motors, while mud pumps are driven by two Elliott shunt field units, each capable of 600 hp at 600 rpm. All of the drilling control is located at the driller's console on the derrick floor. The driller can utilize the generator sets singly or in pairs, transferring power from one operation to another as his needs demand. The





Each Alco Model 251 diesel provides 800 hp at 900 rpm for the drilling barge, *Henry Bell*. Each engine is skid mounted with two main and one auxiliary generators. One workman inspects the compact main control cabinet while the other checks engine connections.

control cabinet consists of main power contactors, control relays, overload relays and a distribution panel for auxiliary power.

A feature of the Alco rig is its comparative light weight, which permits it to be moved easily by truck from one land location to another. Furthermore, its design allows an even weight distribution if mounted on a drilling barge such as the *Henry Bell*. Each of the two generator sets weighs a total of 51,910 pounds. The motors and auxiliaries for the draw works weigh 15,580 pounds while the mud pump motor assembly, mounted on an individual skid, weighs a total of 7840 pounds. The Alco power plant will consume only 15 to 20 percent of the fuel required by a steam plant of the same power and about 10 percent less fuel than in diesel-mechanical operation, according to Alco.

The barge *Henry Bell* is one of the most advanced designs for shallow water drilling. The hull is 180 ft. long, 40 ft. wide, and draws 4 ft. 6 in. when fully loaded. In addition to machinery and storage space for pipe, mud, cement and other materials, the barge has living accommodations for a full drilling crew. Pumps and engines are completely enclosed, and storage space is provided for 1100 barrels of circulating mud, 47,000 gallons of diesel fuel and 4000 sacks of bulk mud. The rig has an Emsco steam-type draw works, with two Gardner-Denver Model GXP, 625 hp mud pumps. A Lee C. Moore derrick substructure has a capacity of 1,650,000 pounds, and the 136 ft. Muscogie Iron Works derrick has a capacity of 900,000 pounds. Other drilling equipment on the barge consists of a 450-ton crown block, and a 350-ton hook and traveling block. The rig is capable of drilling to depths of more than 15,000 ft.

The more spectacular offshore drilling operations from the man-made islands at sea and the grotesque giant submersible units have captured the public imagination in recent years, but drilling from barges in the Louisiana swampland has been an established practice for more than a quarter of a century. Thousands of producing oil and gas wells have been drilled in this manner, usually in water only a few feet in depth, or in marshlands without foundation to support a conventional rig. These barges have ranged from converted liquid and deck barges, supporting only the derrick and machinery necessary for a drilling operation, to large, modern, self-contained units, like the *Henry Bell*, which provide living quarters for the crew, vast storage areas, and contain the latest in dieselized drilling rig power units.

PLATTSBURG, N. Y.

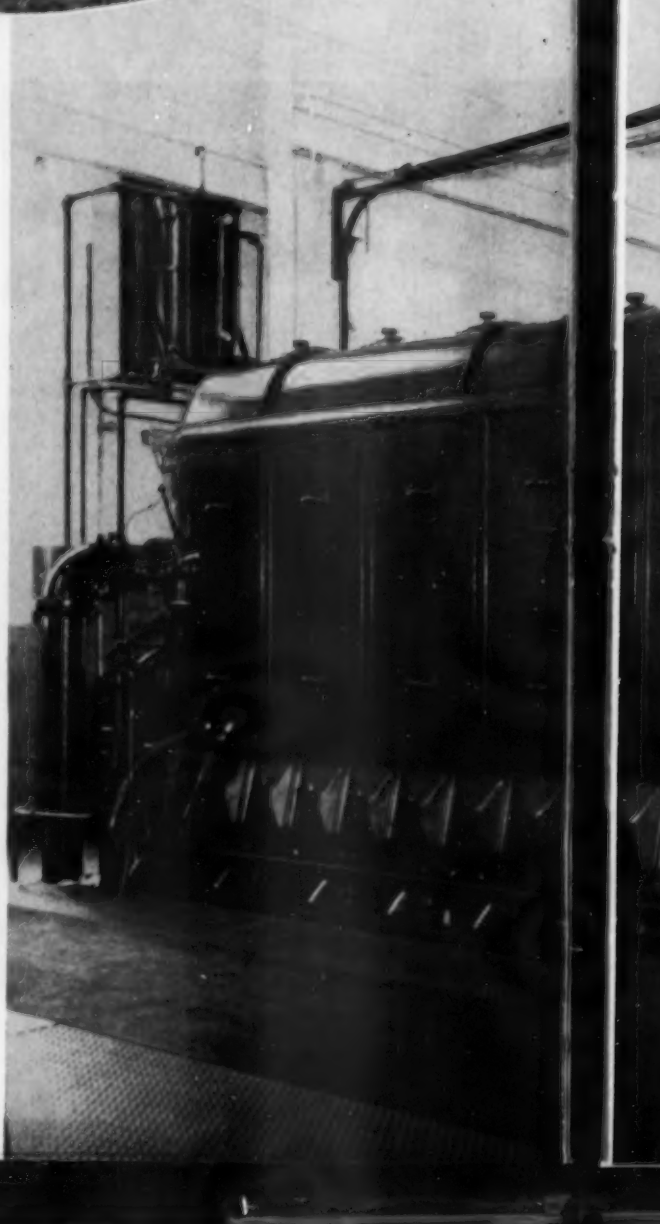
A 1600-hp Fairbanks-Morse opposed-piston diesel engine helped carry the city of Plattsburg, N. Y., and surrounding area through a severe hydro-electric power crisis in the winter of 1953-54. Water supplies throughout the region had steadily dwindled, cutting production at four hydro stations on the nearby Saranac River and threatening the entire region with a partial blackout. To compensate for the loss in hydro power, the Plattsburg Municipal Lighting Department operated its 2100-kw standby diesel plant on a 24-hour schedule and rushed installation work on a new 1600-hp Fairbanks-Morse opposed-piston diesel engine. By November 16, far ahead of schedule, the plant had succeeded in putting the new engine on the line, and, with standby power alone, was in a position to meet its full residential and part of its commercial demand. This freed sorely needed hydro power for use in surrounding communities and helped curtail the effects of the power shortage.

Driving an 1136-kw alternator, the new Fairbanks-Morse engine raised the generating capacity of the Plattsburg standby plant to 3236 kw, sufficient to carry 40% of the city's normal demand in times of emergency. Until it was installed, the plant's three 1000-hp Fulton diesels, part of the original equipment, could carry only 26% of the demand, less than the normal residential load alone. To emphasize the emergency status of the new unit, plant officials have given it a coat of bright fire-engine red paint, adding greatly to the attractiveness of the plant's interior and making their new O-P one of the most "colorful" if not one of the "best-dressed" diesel engines ever installed anywhere.

No idle Beau Brummel, the O-P has been operating at unusual high efficiencies for a standby engine. According to Stanley W. Niles, business manager of the Municipal Lighting Department, and Walter W. Gottburg, plant superintendent, the new engine has been delivering power at the rate of 14 kw/hrs per gallon of fuel oil, despite intermittent service. Housed in a 34x65-ft. wing, recently added to the plant building, it can be placed on the line at full load in a flat two minutes and has become the plant's base load unit.

Plattsburg's Municipal Lighting Department, which in 1953 distributed a total of 42,720,810 kw/hrs among 5079 connected customers, including 4,793,400 kw/hrs generated with its own facilities and 37,927,410 kw/hrs purchased, decided in favor of adding a new engine when in 1952 its standby capacity fell below the city's normal residential load. Familiar with the periodic occurrence of water shortages in this section of the state, the department called in the engineering firm of Burns and McDonnell to prepare a survey of the city's present and future power needs. As a result of this survey, bids were subsequently let and construction begun in the spring of 1953 on a new addition to the plant building. Space for a total of three new O-Ps was provided. By beginning construction early that year, the plant was able to rush the installation of the new engine at the first sign of the winter water shortage, having it ready for testing on September 17 and putting it on the line on November 16. Mr. Niles described the availability of the 1600-hp O-P during the emergency periods as a "godsend" to both the city and the surrounding communities.

In practice, the O-P provides sorely-needed protection against the possible failure or inadequacy of hydro-electric power. Past records show plant production at its lowest point during the spring, when water stocks are plentiful, at its peak in the summer and early fall, when there is apt to be a shortage of water, at its lowest once more after the autumn rains, and moderately high in the late winter. Another important consideration in the selection of the new O-P was economy. The Plattsburg plant, though a standby, had in the past produced as much as 6,000,000 kw/hrs in a single 12-month period and as a result had always stressed heavy-duty operation and high efficiency in the design and selection of its equipment. In its first 13 years of service, from 1941 to 1954, the department returned almost $350,000 to the city in the form of free municipal electricity and saw its fixed assets rise from $729,892 in 1941 to $1,595,959 as of December 31, 1953. An example of its sound financial condition is the manner in which it paid for the recent expansion program. The full cost of the new engine, including the construction of the new wing, basement, and auxiliaries, was paid for in cash from the department's construction fund. Such solvency is the result of careful planning and supervision—not high rates. In fact, a comparison of rates for residential consumers in the city of Plattsburg with the national average, as compiled by the Federal Power Commission, shows that Plattsburg is well below average. Despite the fact that the department is currently paying approximately 20% more for purchased power than it did last year, it has not raised its rates. The average cost of 250 kw/hrs



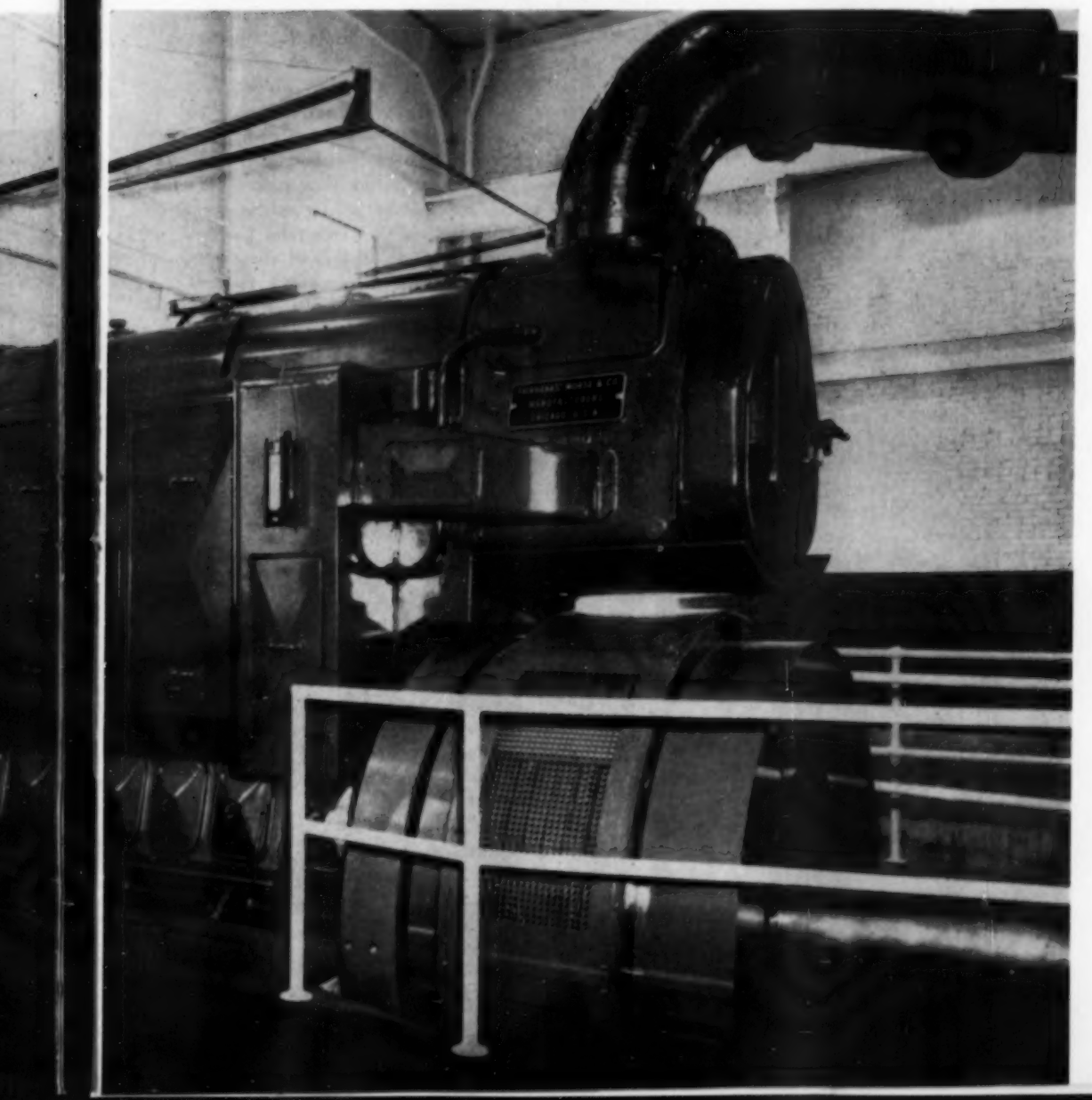
Threatened With Critical Hydro Power Shortages, Municipal Standby Plant at Plattsburg, N. Y., Rushes Fairbanks-Morse O-P Into Service

for residents of Plattsburg today is $5.90, while the national average for the same number of kilowatt hours is $6.78, almost 19% higher. Plattsburg rates now average 2.44¢ per kw/hr for residential consumers, 2.70¢ for commercial consumers, and 1.28¢ for industrial consumers.

The new Fairbanks-Morse engine was acquired to help improve this already robust financial picture at Plattsburg. In addition to providing needed additional standby protection, the O-P was intended to provide low-cost, efficient power for peaking. With an operating record of 14 kw/hrs per gallon of fuel, the O-P has been busy fulfilling these plans. Reduction of demand charges through diesel peaking service must wait, however, upon negotiation of a new power contract.

At the present time the Municipal Lighting Department is purchasing power at an average rate of 1.0¢ per kw/hr, including energy and demand charge, from the New York State Electric & Gas Corp., which took over the Saranac properties of the court-dissolved Eastern New York Power Co. in December, 1953. According to the terms of the new contract, the New York State Electric & Gas Corp. supplies power from its four hydro stations on the Saranac River up to 8500 kva, with all power over that amount and up to 25,000 kva being supplied via a tie-in transmission line from the steam-hydro plant of the Niagara & Mohawk Power Corp. There is a $2.00 demand charge for all hydro power over 2100 kva and a $2.35 demand charge for all steam power over 8500 kva. In addition, there is a billing demand clause which specifies that the billing demand shall not be less than 83% of the highest kva billing demand established in the preceding 11 months. Thus, with a peak demand of 10,694 kva in January of 1954 (the plant's power factor that month was 91%), the department was billed for a minimum of 8876 kva for each of the succeeding 11 months of the year, whether or not its demand reached this level. With an average load factor of 60%, Mr. Niles estimates that this clause alone is currently costing the department an average of $2000 per month.

A control-side view of the new Fairbanks-Morse 1600-hp diesel which has been operating at a rate of 14 kw/hrs per gal. of fuel. It is equipped with Kewanee-Ross heat exchanger and Amot thermostatic valves.



If the department were able to use its new O-P for peaking at the present time, it would help reduce these demand charges considerably and would modify the effects of the billing demand clause. However, such use of the O-P engine for peaking would have no effect on demand charges under the present arrangement. The current contract requires the city to sell all power generated directly to the utility, which in turn sells it back to the city at the same energy rate plus demand charges. In effect this would nullify the benefits of peaking. Before the current contract expires in five years the city hopes to secure a cheaper source of power.

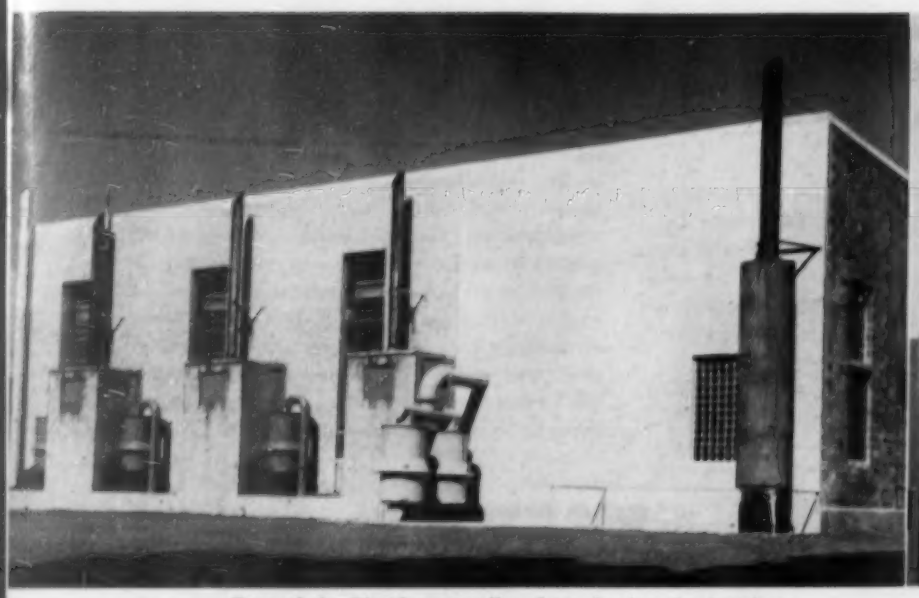
Plattsburg is a city of 18,738 population, located just south of the Canadian border on the shores of Lake Champlain. Sandwiched between the Green mountains of Vermont and the famous Adirondack mountains of New York, it is a rich summer and winter vacationland, attracting thousands of tourists the year around. Its principal industry consists of two large paper mills, the Diamond Match Co. and the Imperial Paper & Color Corp.

The history of municipal power in Plattsburg goes back to 1935-1936. (See DIESEL PROGRESS, Sept. 1941.) At that time an engineering survey was conducted and the people voted almost 2-to-1 to purchase the existing distribution system within the city's limits and to establish a Municipal Lighting Department. It was conceded that a fuel-oil-burning plant could not produce power for less than 7 mills per kw/hr and a contract was signed as a result with the Eastern New York Power Company for the purchase of power at that rate from four hydro stations on the Saranac River. City officials wisely felt that further steps had to be taken to protect the department's consumers against familiar water and hydropower shortages. Accordingly, a standby diesel plant, equipped with three 1000-hp diesel engines, was constructed in 1941 at the present site. With a generating capacity of 2100 kw this plant was sufficient at that time to carry the city's entire load in times of emergency.

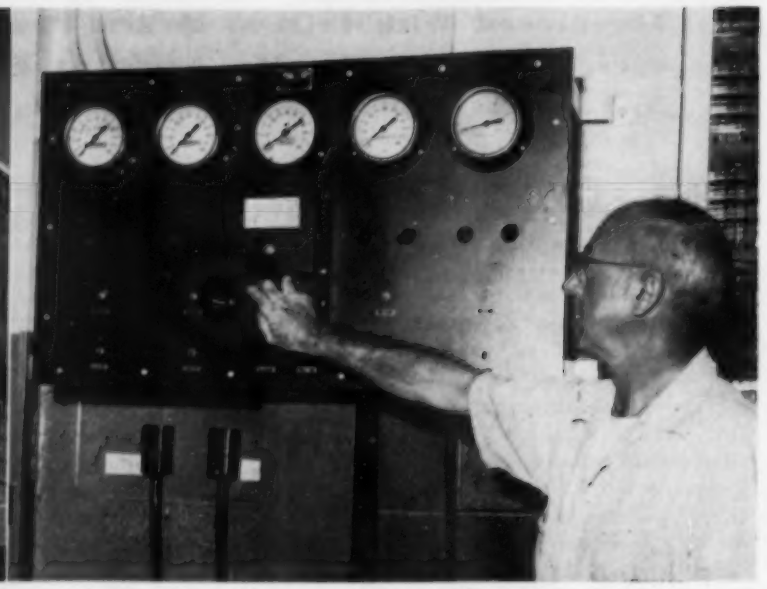
The city grew in size, however, and the standby protection afforded by the new plant gradually became less and less adequate. By 1948 the city's peak demand had reached 5400 kw, more than 2½ times the plant's 2100 kw capacity. By 1952 the demand had increased so much that the outstripped plant could no longer handle the full residential load, not to mention its commercial and industrial loads. A survey was subsequently conducted and the new Fairbanks-Morse O-P engine installed. The demand has continued to rise since then and in January, 1954, it reached 9732 kw. To carry future peaks, space has been provided in the expanded plant for two more O-P's of equal or greater size.

The new engine is a Model 38D8-⅛, 2-cycle, 10-cylinder, 8-⅛-in. bore and 10-in. stroke, opposed-piston diesel, rated 1600 hp at 720 rpm. It drives a 4120-kva, 1136-kw, 3-phase, 60-cycle, Fairbanks-Morse alternator, which is direct connected to a 10-kw, 80-amp, 125-v, 720-rpm, F-M exciter.

No. 2 diesel fuel is delivered at the plant by truck or railroad tank car and is unloaded by means of



Rear of the Plattsburg standby plant, showing the American Cycoil air intake filter and Maxim silencer which serve the new engine.



R. C. Lyon, chief operator, checks the Alnor pyrometer. Viking Instruments supplied the panel and Duro Instruments the gauges.

a motor-driven centrifugal pump through a pair of full-flow strainers to two 12,000-gal. and one 10,000-gal. above ground storage tanks. Two motor-driven centrifugal pumps pick it up from storage and send it through a pair of strainers on the suction side of the pumps, through a recording meter, to a 350-gal. day tank, equipped with a level meter and located immediately beneath the O-P in the basement of the new wing. The fuel is then picked up from the day tank and sent through a duplex filter to the double injection pumps and nozzles at each cylinder by a built-in, engine-driven pump.

A high-detergent type lube oil is circulated under pressure to all wearing surfaces and to the pistons for cooling by a built-in pump, driven off the O-Ps lower crankshaft. After leaving the engine, the lube passes through an automatic, thermostatically-operated control valve to a shell-and-tube type cooler, through a full-flow strainer and then back to the engine. To maintain the lube at the most efficient temperatures and to provide additional filtration, a controlled amount of lube is by-passed from the thermostatic valve and returned to the engine through a 5-cartridge, cellulose-packed filter. For starting and shutting-down operations, a before-and-after pump is provided.

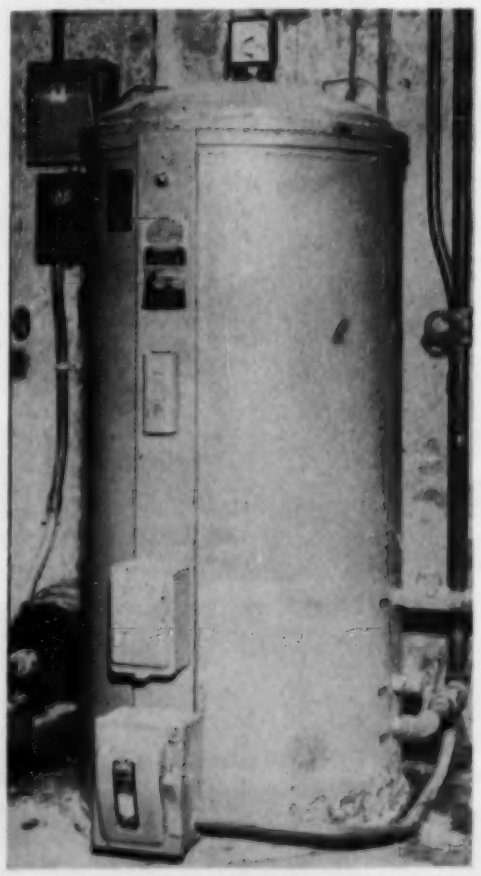
In keeping with the high economy of this unusual plant, dirty lube drains from the engine to a 340-gal. sump tank in the basement, where it is forced through a cellulose-type purifier and returned to the engine. If desired, the purified lube can be sent to a 340-gal. clean oil storage tank instead. A motor-driven transfer pump sends it from this storage tank to the engine when needed.

Water from the city's mains, treated first in a zeolite softener, is used as a cooling medium in the closed-jacket water system. An engine-driven pump circulates it through the cylinder jackets, through an automatic temperature control valve, through a heat exchanger, and then back to the engine. City water is also used in the raw water circuit, pressure in the mains circulating it through the lube cooler and heat exchanger before discharge.

Scavenging air for the engine-driven blower is drawn through an oil-bath type filter at the rear of the new wing, while starting air at a pressure of 250 lbs. is supplied by a two-stage air compressor. Exhaust gases are expelled through a vertical silencer, also located at the rear of the building. Flexible metal hose connections are used to absorb vibration on all lube, jacket water, raw water and scavenging air lines, each connection measuring 18-in. from end to end.

Mounted on a wall at the control end of the engine is a high-readability gauge panel, equipped with a multi-point exhaust pyrometer and pressure gauges on fuel oil, lube oil, jacket water, raw water and scavenging air. Visual and audible alarms are provided on each of the above pressures with the exception of scavenging air which is equipped with a pilot light only. A separate alarm warns of a main power failure.

Dirty oil drains into a storage tank to the left and is pumped through this Honan-Crane lube oil purifier. The day tank is fitted with a Liquidometer.



Mr. Niles and Mr. Gottburg are the men principally responsible for the careful planning, foresight, and close supervision which has resulted in success for Plattsburg's Municipal Lighting Department. This plant, with its record of high dependability and efficiency, directly or indirectly protects an entire region in northeastern New York State and proves the wisdom of designing a standby power plant for heavy-duty, high-economy operation. R. C. Lyon is the plant's chief operator. Ultimate responsibility for the success of the plant, of course, rests with Mayor John J. Tyrell and with the following members of the department's Board of Directors: Redmond J. Holland, Alfonso Villoni, Robert C. Laravia, Richard S. Arbenger, and Elmore Brewster.

List of Equipment

Engine—Fairbanks-Morse Model 38D8⅛, 2-cycle, 10-cylinder, 8⅛x10 in., opposed-piston diesel, rated 1600-hp, at 720 rpm.
Alternator and exciter—Fairbanks-Morse.
Governor—Woodward.
Fuel oil strainers—Niagara.
Fuel oil duplex filters—Nugent.
Fuel oil meter—Buffalo.
Day tank liquidometer—Liquidometer.
Lube oil—DEE Socony-Vacuum.
Lube oil purifier—Honan-Crane.
Thermostatic valve—Amot.
Lube full-flow strainer—Air-Maze.
B & A lube pump—Roper.
Clean oil and dirty oil tank pumps—Viking.
Heat exchanger—Kewanee-Ross.
Air compressor—Gardner-Denver.
Air intake filter—Cycoil.
Exhaust silencers—Maxim.
Exhaust pyrometer—Alnor.
Gauge panel—Viking.
Flexible pipe—Atlantic.

DIESELS TO AID RESEARCH IN ANTARCTIC

By MARK OGDEN

SEVERAL of the most fascinating of many interesting chapters in the continuing story of diesel engine development and utilization are being written in the polar regions. Three stimulants of international scope are increasing the tempo of diesel activity in both the Arctic and the Antarctic. Two of these factors—operation of important Arctic weather stations and construction of the U.S.-Canadian Distant Early Warning (DEW Line) radar network—were reported in DIESEL PROGRESS for June, 1955. Now comes what undoubtedly will prove to be the most significant long-range development of all—the International Geophysical Year.

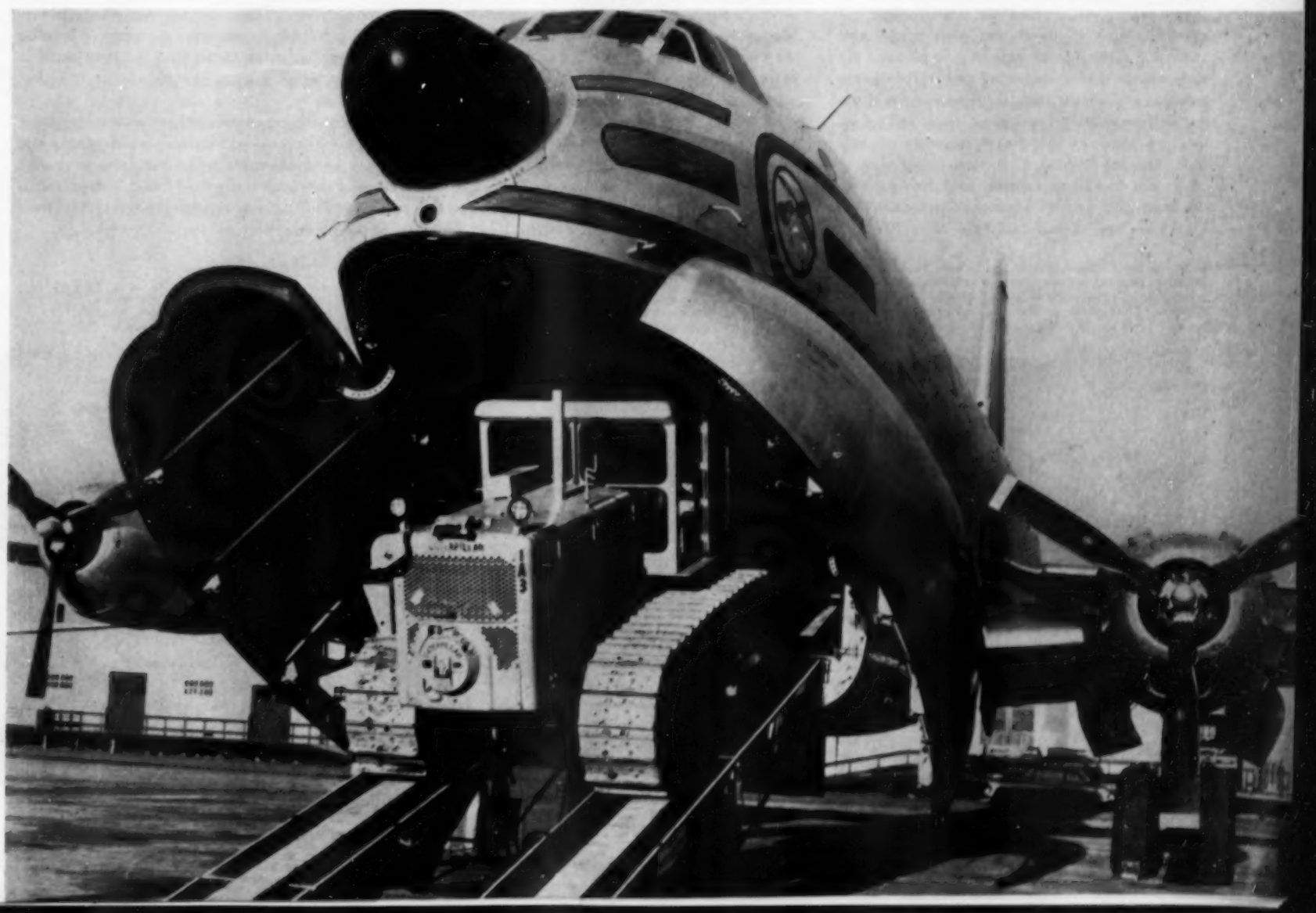
Scientists of at least 40 nations are preparing to participate in an intense global series of coordinated observations and measurements in the principal fields of geophysics. At an estimated cost of $300 million—some considerable proportion of which will be spent on diesels and dieselized equipment—they will apply their research throughout the years of 1957 and 1958. This period was selected because it coincides with the eminent peak of the solar cycle. An abundance of eclipses, flares, meteor showers and other disturbances are foreseen for those years. Coordination of plans and scientific findings is the responsibility of a special committee of the International Council of Scientific Unions.

A First International Polar Year was carried through by world scientists in 1882-83. Fifty years later, in 1932-33, the Second International Polar Year was observed. Activities then revealed, for one thing, that the polar regions had become easily accessible for scientific observations. Also, interest generated at the time led to the establishment of the Geophysical Institute of Alaska, near Fairbanks. Other great centers of research in geophysics had been functioning in Greenwich, Paris, Potsdam, Washington, Tokyo, Leningrad, Canberra and Ottawa. Although these permanent centers encircle the globe, vast areas of the universe lie beyond their range, especially sectors radiating from the poles. These gaps will be plugged during the concentrated studies in 1957-58 with 21 observation posts being planned for the remote Antarctic plus a few additional stations in the Arctic. The North Pole region already is fairly well covered with permanent stations maintained by such nations as the U.S., Russia, Canada and Denmark.

In previous Geophysical Years, only three or four major fields of geophysics were intensively studied. The forthcoming observations, however, will cover 10 fields: solar activities; longitude and latitude determination; glaciology; oceanography; meteorology; geomagnetism; aurora and airglow; ionospheric physics; cosmic rays; and rocket studies of the upper atmosphere to investigate temperatures, pressures and air motion.

Phrased in such terms, the average builder, seller, or user of diesel engines might wonder what possible bearing the program of the scientists could have on his daily life. In answer, the geophysicists point out, for example, that their forthcoming research should greatly advance man's knowledge of weather. Radio and television broadcasting and

Dieselized equipment frequently is transported to Arctic and Antarctic bases by USAF C-124 Douglas Globemasters. Here a Cat D8 is being loaded during "Operation Big Haul" when 6600 tons of tractors, buildings, and other heavy material were airlifted into the Far North for use in constructing the DEW Line.



A winterized diesel tractor is shown in use at the Mould Bay station operated in Canadian territory by the U. S. Weather Bureau. Supplies flown from Resolute Bay, Canadian NWT, are being hauled from the airstrip to the weather station. The cargo plane belongs to the Royal Canadian Air Force, indicating the degree of cooperation between the neighboring governments.

reception may well be improved as a result of discoveries made. Air and sea navigation should gain in accuracy when additional knowledge is acquired about the strength and direction of the earth's magnetic field. Also, the practice of both air and sea navigation will be aided by the proposed studies of air and sea currents, magnetic storms, and irregularities in the earth's rotation.

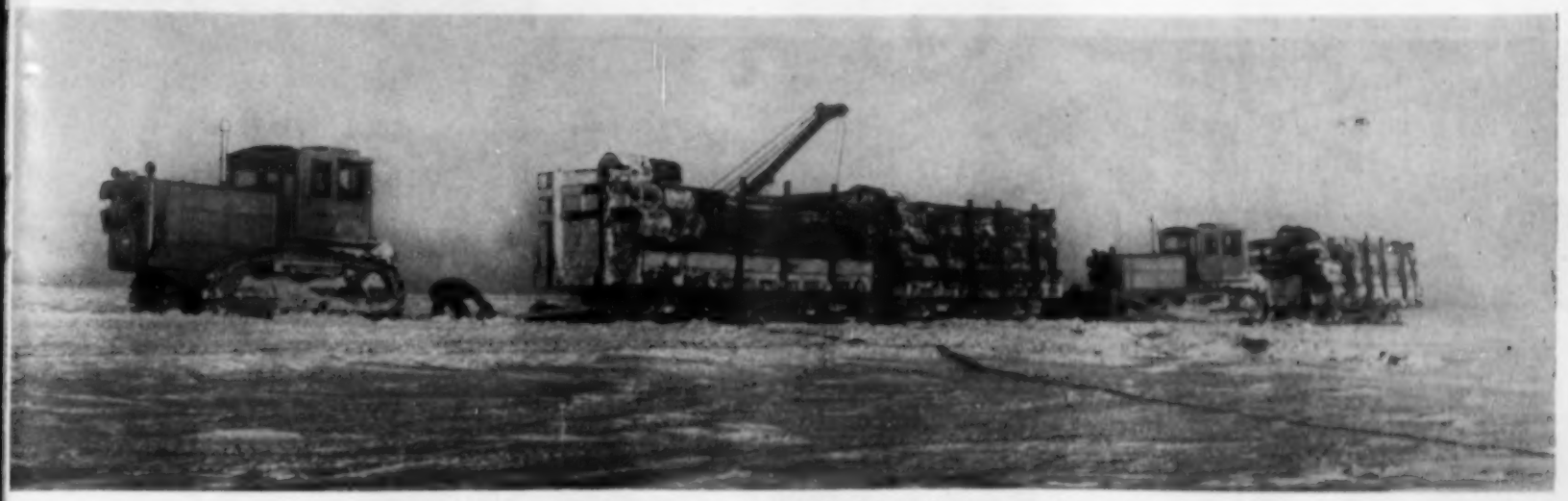
Diesel engines will be utilized to established and operate temporary observation posts in the Antarctic and other remote areas to give scientists the wide distribution of measuring and reporting centers that will permit them to "generalize with the required precision." The United States will set up three of these in the "water hemisphere," and Rear Admiral Richard E. Byrd is coming out of retirement to lead an expedition in November to the South Pole to make advance preparations. The U. S. Navy has assigned Task Force 43, under command of Capt. George Dufek, to carry out the mission which has been named Deepfreeze. It is an interesting sidelight to note that Soviet scientists have been assigned to set up neighboring bases in the Knox Coast section of the Australian Antarctic.

Dieselized equipment that will be taken south in November by the Task Force to set the stage for the geophysical studies of 1957-58 includes 21 track-type tractors and 16 diesel-electric generator sets, all powered by Caterpillar diesel engines. Ten of the crawlers are standard 155 dhp D8 units with extra long, extra wide tracks to give ample traction on snow and ice. These machines will have 9-roller track frames, 54 in. shoes and 106 in. gauge. They will be equipped with hydraulic dozers. Six machines will have Hyster D8D towing winches and four will have Hyster TLA8 cranes. There will be nine D2 tractors of 38 dhp. These also will be low-ground-pressure machines, as will be three additional D4 tractors equipped with fork lifts to unload cargo airplanes. The expedition will have 13 Caterpillar D315 electric sets and three D42 electric sets. The former deliver 30 kw, the latter 100 kw. The D8s will be used primarily on tractor trains; the D2s in construction of snow runways, utilizing Seaman Roto Tillers, equipped with Cat D318 engines. The D4s will load and offload aircraft. The U. S. Navy's Bureau of Yards and Docks let the contract for this equipment. It has asked the Caterpillar service department to arrange a training program for about 15 Seabees, who will learn to operate and service the equipment.

Initially, the expedition will set up a main station in the Little America area from which parties will move by tractor trains in October, 1956, to set up a second station in Marie Byrd Land. A third station will be built later at or near the South Pole, from materials moved in by air.

J. Glenn Dyer, Chief, Arctic Operations Project, U. S. Weather Bureau, is shown on a visit to the most northerly land weather station in the world, Alert, NWT, Canada. The grader is used in maintenance of the airstrip at the weather outpost.

The first phase of DEW Line construction was the airlift, "Operation Big Haul." Around-the-clock flights were necessary during the brief period when such landings could be made. Caterpillar diesel equipment was massed at staging areas as shown in the picture below.



Above are shown the sledges, adapted from dogsleds, used in transporting supplies in the Arctic and Antarctic. Winterized diesel tractors provide the motive power. A shipload of such equipment starts for Little America in November for use during the International Geophysical year 1957-58.

American manufacturers have made remarkable advances in recent years in learning to winterize diesel engines and equipment—to withstand temperatures as low as 70° below zero. Establishment of weather stations, air bases, and finally the DEW Line provided the incentive for research and development work in winterizing.

Work on the DEW Line actually began in 1953 when Western Electric Company, manufacturing and supplying unit of the Bell Telephone system, commenced the project by studying methods and equipment for operation under severe Arctic conditions. The equipment they developed is described as "semi-automatic electronic detection devices." Power for operating this equipment is provided by diesel generator sets. Then, last February, Western Electric was named prime contractor for construction of the DEW Line beyond the Arctic circle. Subcontractors include: Puget Sound Bridge & Dredging Co.; Johnson, Drake & Piper, Inc.; both of Seattle; the Northern Construction Company and J. W. Stewart, Ltd., of Vancouver; and Foundation Company of Canada, Ltd. of Montreal.

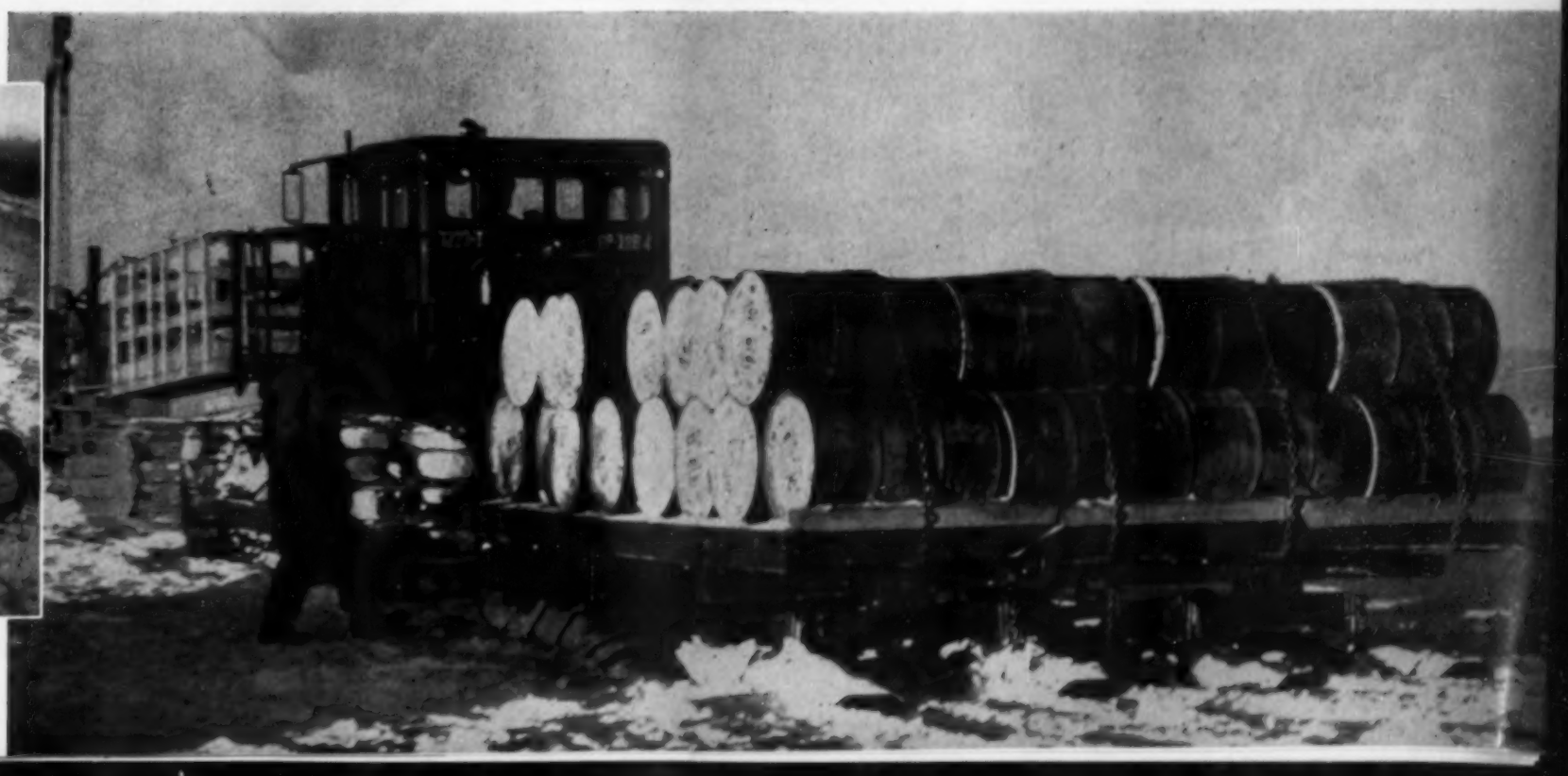
As soon as the construction actually got under way, dozens of Caterpillar crawler tractors, scrapers, shovels and electric generating sets were shipped northward. The mobile equipment is used in handling three types of essential work. First, the tractor trains move freight over land from staging areas supplied by airlifts. Second, bulldozers and scrapers are used in the actual construction of the radar stations and in keeping air strips, roads, and the rubber-domed radar installations free of snow. Third, tractors with fork-lifts are used in loading and unloading cargo planes—and ships which are able to reach the sites in certain months of the year.

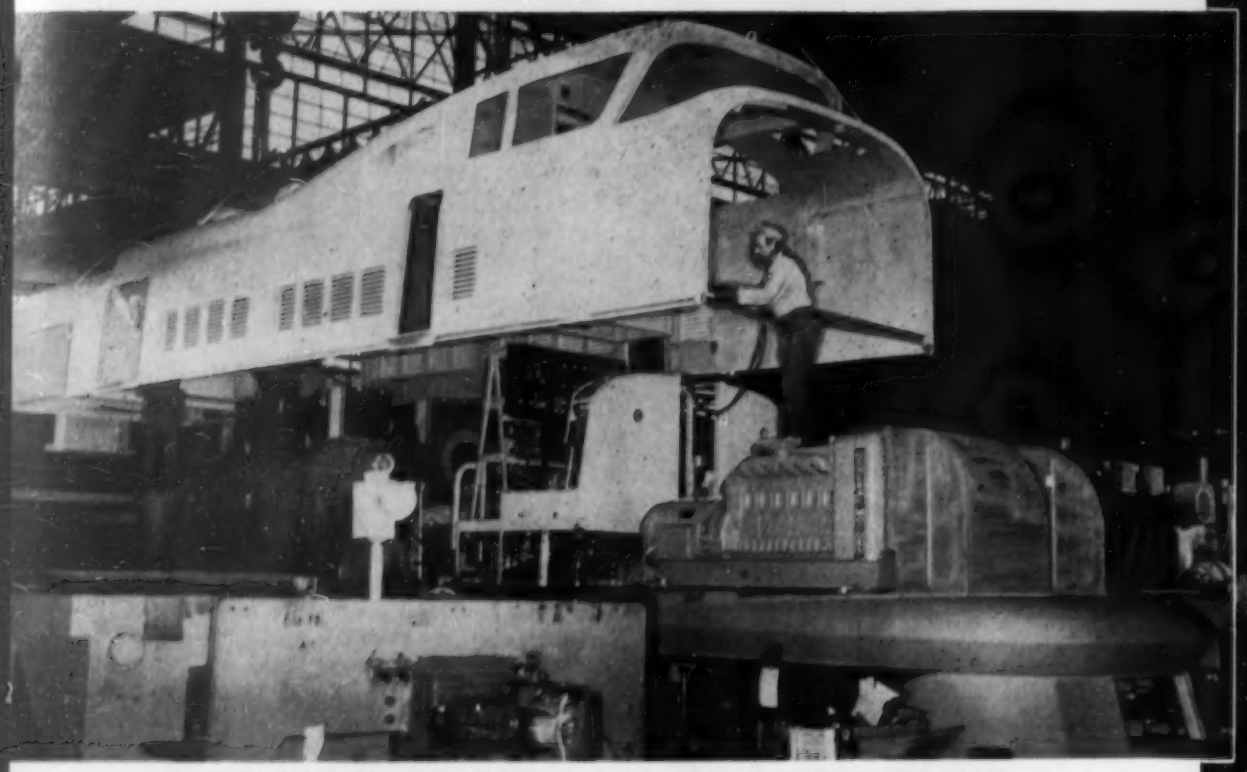
Prior to the start of construction on the DEW Line, dieselized equipment proved itself in the far north under adverse conditions by helping to establish and maintain air bases and weather stations. Two of the farthest north stations—that could hardly have been built had it not been for dieselized equipment—are the Thule Air Base in Greenland and another at Point Barrow, Alaska.

The U. S. Weather Bureau in the United States Department of Commerce has a special "Arctic Operations Project" under J. Glenn Dyer, Chief. In cooperation with the government of Canada, the Weather Bureau maintains stations in the northwestern territories of Canada. Through Danish cooperation, another is operated on the eastern side of Greenland. These bases have been named Alert, Resolute Bay, Isachen, Eureka Sound, and Arctic. In addition, for many months, a station was maintained on a floating ice island until the island drifted so close to permanent stations that it was no longer doing effective work.

The latest chapter in diesel history, therefore, will reveal that diesel engines and dieselized equipment played vital roles in helping man overcome hazards and conquer earth's last geographic frontiers.

One of the biggest supply items involved in maintaining weather observation and radar aircraft detection bases in polar regions is diesel fuel. Diesel-electric sets are the sole source of electricity at these remote stations, and diesel tractors and graders are required to keep stations free of snow and ice. Here a load of fuel oil is being transported from the airfield to the weather station named "Alert."





Right—The General Motors concept of what a modern, American-built, lightweight passenger train should look like. The all-GM train was unveiled for public inspection at GM's Powerama in Chicago. *Top*—Under construction at the Electro-Motive Division plant in La Grange, Ill., photo shows car body being lowered onto the locomotive's under-frame.

THE NEW LIGHTWEIGHT DIESEL PASSENGER TRAINS

By SIDNEY HOFFMAN

WHEN a few unobtrusive, self-propelled railcars made their appearance on American rails about 30 to 35 years ago, no one dreamed that they were harbingers of the lightweight, high-speed train that recently began to capture the imagination of railway executives. The advent of the railcar, followed quickly by the successful application of diesel engines to locomotive service, started a parade—a parade of lumbering steam locomotives spewing smoke, cinders and dust over passengers and countryside which has just about ended—the termini being museums and scrap heaps.

Impetus was given the parade in 1935 by the spectacular dusk-to-dawn run of the Burlington Pioneer Zephyr from Denver to Chicago's Century of Progress. The prime mover in the historic Zephyr's locomotive was built by GM's Electro-Motive Division.

The new lightweight train is the modern evolutionary end result, in the revolution in railroading started by the railcars. Today, there are major railroads where steam locomotives are non-existent. The last holdout against diesels recently succumbed by ordering eight general purpose diesel locomotives although the backbone of its business is hauling bituminous coal.

In freight service, not only has diesel motive power reached high levels of efficiency and flexibility, but the past several years have witnessed the application of diesels to mechanically refrigerated cars, making the ice cars obsolete. Dieselized switchers of every type and for every purpose contribute their important function in smoothing the flow of material through the railroad freight yards.

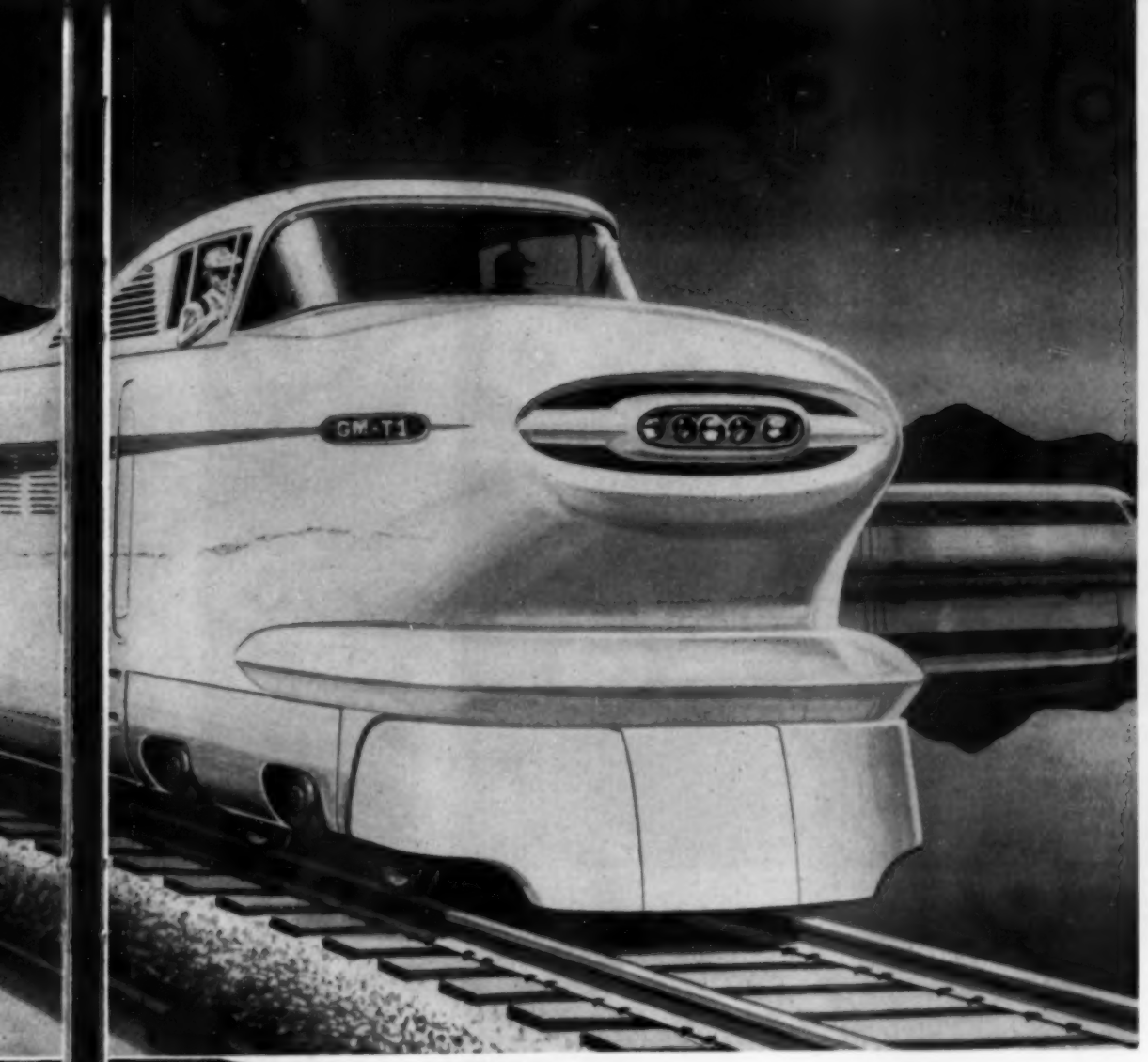
It is in passenger service, however, where the railroad industry is hard pressed. And this is where the new lightweight trains offer relief. It is a known fact that many lines operate passenger service at a loss. Air and highway travel have taken their toll from rail revenue. In an effort to build passenger revenue and cut operating costs while maintaining speed, service and comfort, major engine builders have taken a long, serious look at the situation. They are now coming up with the answer.

Both General Motors and Baldwin-Lima-Hamilton have built new lightweight locomotives. American Car & Foundry has unveiled its Spanish Talgo-type lightweight train. Budd and Pullman also are building new types of lightweight passenger cars.

Baldwin-Lima-Hamilton has obtained the license to build a German design locomotive in this country. However, in filling its first few orders and pending further tests, B-L-H will use German-built components, according to reports.

The new B-L-H locomotive is an adaptation of the V-80 series of the German Bundesbahn. This latter locomotive was developed after World War II as the cooperative venture of a number of German firms. Daimler-Benz, MAN and Maybach developed the engine. Voith, Maybach and Krauss-Maffei provided the transmissions. Henschel, Krupp, Maschinenfabrik Essingen and MAK locomotive producing plants lent further cooperation.

Three different engine types and two transmission types have been used in Germany to keep competition alive. The V-12 diesel engines in the original German design are supercharged, high-speed engines developing 800 to 1000 hp. Reports state that, currently, the German builders are designing a 20-cylinder engine for greater power and flexibility. Unlike the commonly accepted and proven diesel-electric drive used in this country, the German locomotive is a direct-drive unit. Power is transmitted to the wheels through either the Voith triple hydraulic converter or the Maybach Mekydro transmission which consists of a torque converter and

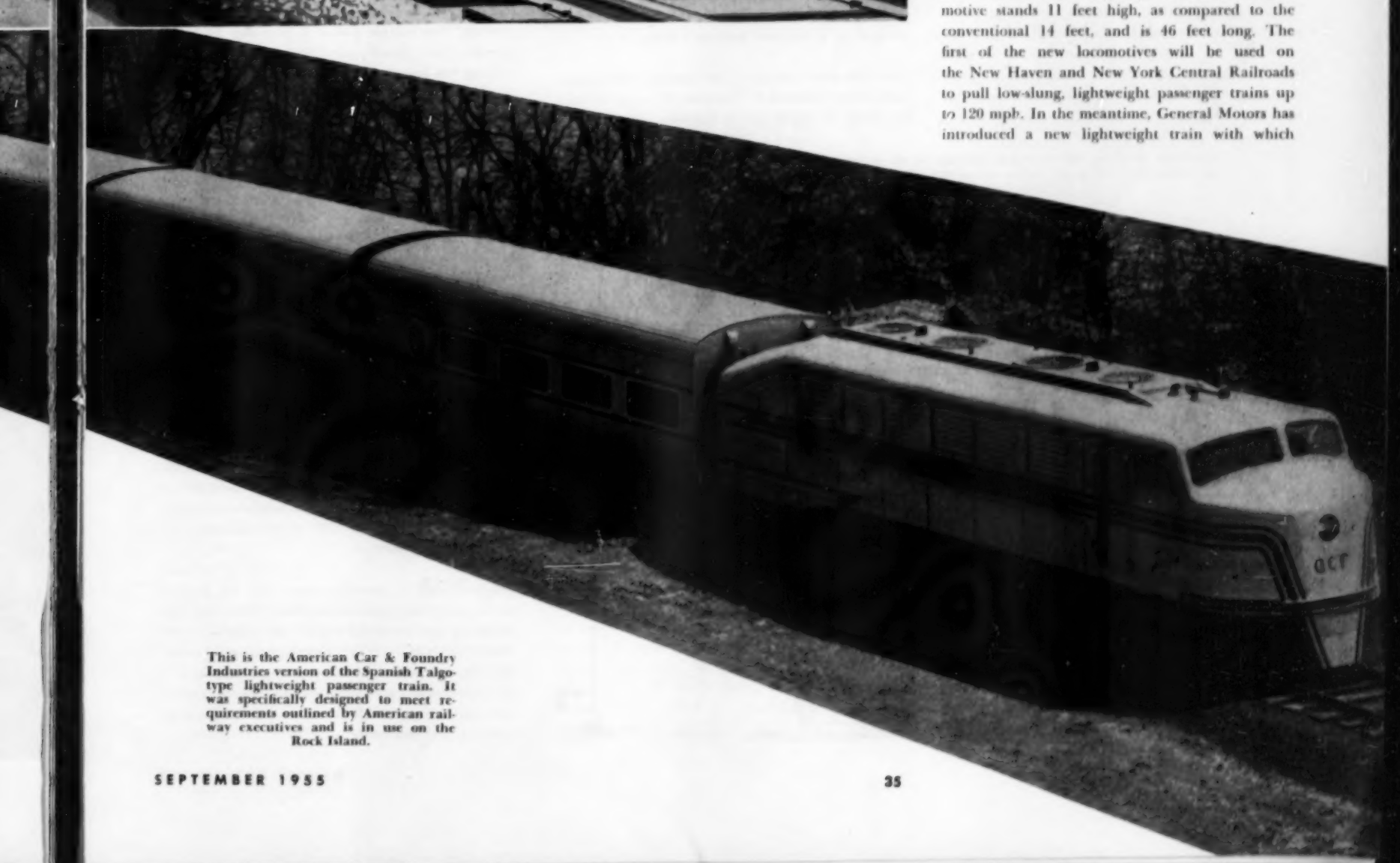


four automatically shifting speeds. The Maybach transmission will be used on the American version. This type of hydraulic drive, while new to American mainline railroading, has had considerable application on European railroads. It has proven itself in years of hard service.

It is noteworthy that Baldwin-Lima-Hamilton recently delivered a direct-drive diesel locomotive to the U. S. Army. It was built to the Army's specifications with two stated objectives. The Army wanted a prototype engine that could be built in emergencies with the use of a minimum of critical materials, and it wanted one that could be serviced and maintained easily.

The direct-drive principle, used extensively in the past on smaller industrial switch locomotives, is appealing to railroad executives because of its economy. Not only are initial costs less, but fuel consumption has been lower. At the request of Budd, the Allison Division of General Motors designed a heavy-duty transmission on the Torqmatic principle specifically for use in railcars. A recent survey of three types of railcars, reported by Allison, shows the following comparative costs per train/mile: steam railcars, 1.71; diesel-electric, 1.17; and diesel-hydraulic, 0.71.

A comparison between a conventional Baldwin diesel, weighing 30,200 pounds, and the Maybach engine, weighing 9200 pounds, is startling. While developing the same 1350 horsepower, the smaller engine occupies less than one-half the space of the larger engine. It is asserted that the savings in fuel costs will amount to 40%-50%. The Maybach locomotive stands 11 feet high, as compared to the conventional 14 feet, and is 46 feet long. The first of the new locomotives will be used on the New Haven and New York Central Railroads to pull low-slung, lightweight passenger trains up to 120 mph. In the meantime, General Motors has introduced a new lightweight train with which



This is the American Car & Foundry Industries version of the Spanish Talgo-type lightweight passenger train. It was specifically designed to meet requirements outlined by American railway executives and is in use on the Rock Island.

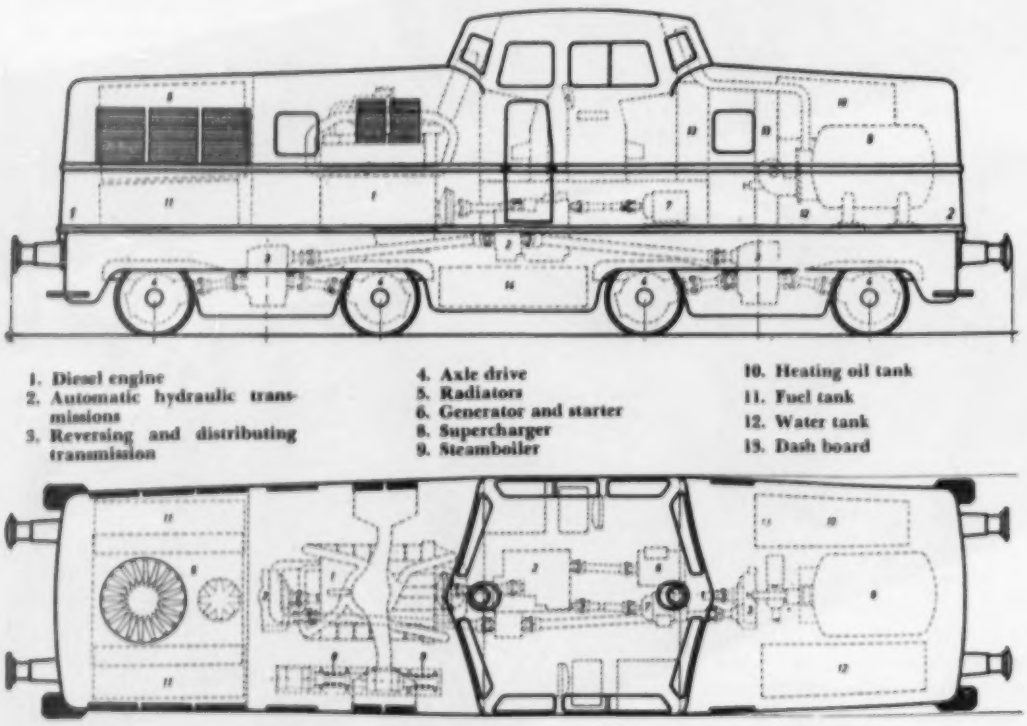
The original Maybach locomotive, built for German service. Baldwin-Lima-Hamilton holds a license to build this unit in the U.S. The lightweight, compact power plant makes this design ideal for fast, comfortable travel.

several railroads will be encouraged to experiment.

The General Motors answer to the demand for lighter, faster, more comfortable and economical passenger trains is based on a principle of its own —that existing, proven components should be used wherever possible and feasible. This principle not only adds to the speed with which a unit can be completed but also lowers the cost and obviates the need for much testing and expensive tooling up that would otherwise be necessary. Authoritative sources indicate that the entire new GM train will cost from $400,000 to $500,000—about one-third of the cost of a standard passenger train.

The GM train consists of 10 coaches and a single unit diesel locomotive. The cars are adapted from the GMC Truck & Coach Division's 40-passenger inter-city highway bus with air-ride suspension. Baggage compartments are under the floor, thus raising the passengers higher than the current lightweight models but still lowering the center of gravity 10-in. from what it is in standard railroad coaches. The motive power is provided by a 12-cylinder diesel developing 1200 hp and capable of pulling 400 passengers at over 100 mph.

These are elevation and floor-plan drawings of the original Maybach lightweight passenger locomotive. Its diesel engine drives the wheels through automatic hydraulic transmissions.



1. Diesel engine
2. Automatic hydraulic transmissions
3. Reversing and distributing transmission
4. Axle drive
5. Radiators
6. Generator and starter
8. Supercharger
9. Steamboiler
10. Heating oil tank
11. Fuel tank
12. Water tank
15. Dash board

Unlike the Baldwin-Lima-Hamilton locomotive, General Motors retains the diesel-electric drive. The generators, traction motors and control apparatus are made by GM's Electro-Motive Division. While GM disclaims any intention of going into the car building business, their GMC Truck & Coach Division built the cars of the first model. Frigidaire provided the air conditioning and Delco Products the auxiliary generators.

Six leading American railroads currently are in the market for a train which is low in initial cost, cheaper to operate, lighter and faster. Each road is going its own way to find the train which would best suit its needs. The first line to place one of the new lightweight units in service is the Rock Island. This is the Spanish Talgo-type train, built by American Car & Foundry Industries, Inc. Each of these Talgo-type cars weighs only one-third as much per passenger seat as the standard coach. The Rock Island Talgo is hauled by an especially designed EMD locomotive.

Different kinds of passenger trains soon will appear on the tracks of American railroads. Whatever the design of the locomotives and cars may be, it is certain the result will be a happy marriage of economy of operation, passenger comfort and speed. Air and highway travel can expect more intensive competition from the railroads because of the new thinking and new designs.

Oliver's new Super 99GM, powered by a General Motors diesel, is shown pulling the latest model Be-Ge Speedhaul carry scraper. The maker claims a 72 hp drawbar for it from factory tests.

OLIVER COMES WEST WITH DIESELS

By F. HAL HIGGINS

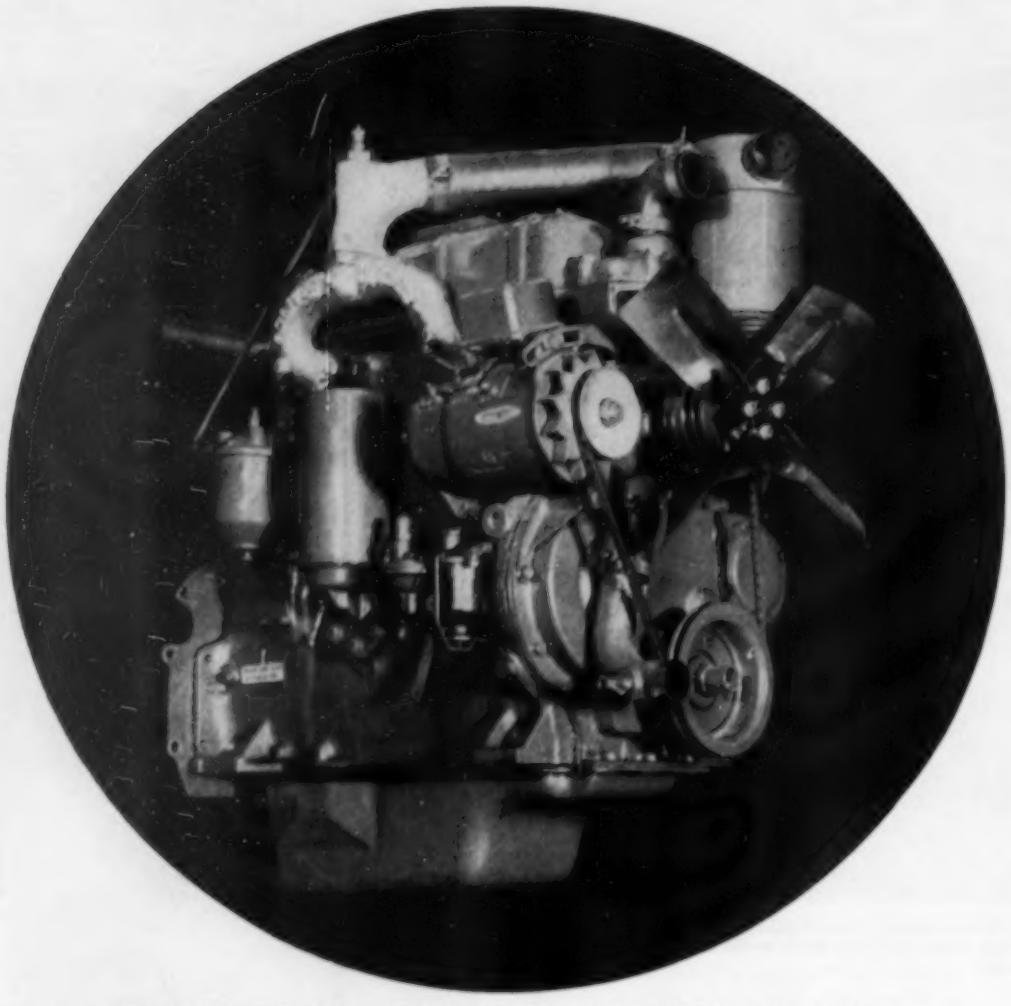
A. King McCord, president of Oliver Corp., is shown addressing the western dealers at the Gilroy, Calif. showing of Oliver's line of farm and earth-moving equipment.

OLIVER is going places with diesels. Its intentions were demonstrated not long ago in a two-day show at its recently acquired Be-Ge plant at Gilroy, Calif. Oliver dealers saw the show the first day, and the public was entertained the second. Everyone left convinced that this veteran plow builder is ready to meet the competition in the farm and dirt-moving fields.

Since the end of World War II, Oliver Corp. has been adding other famous old companies to widen its lines and strengthen its dealers all over the map. It first added Cleveland Tractor Co. to gain a crawler tractor line to compete in the West. Next, it added the famous old Farquhar line for its potato machinery, sprayers and dusters, as well as the more recently developed conveyers. Back of these post-war additions was the 1929 merger of four of the outstanding leaders in farm equipment field: Oliver, Hart-Pharr, that had led the big swing from steam to gas tractors; American Seeding Machine Co., and the Nichols & Shepard harvester.

Western division manager Sam White, Jr., was the master of ceremonies at the two-day show. His organizing genius staged the show and introduced the new Oliver machines which made their debut before his eager western dealers and invited agricultural engineers, editors and the public. Mr. White, in the few months that he has been out on the West Coast has done a real job in getting the Oliver dealer organization perking. His company added the new lines and dieselized its wheel and crawler tractors to meet competition and widen sales in the West.

President A. King McCord gave the company's "western look" policy in his open-air talk to dealers. As head of the 15 directors of Oliver who met in their annual meeting at Gilroy, he was thus doing double duty. The directors are Harold T. Ames, Max J. Brown, Frederick H. Chapin, John R. Covington, C. Frederick Cunningham, Donald Defrees, Eugene W. Kettering, C. I. Ochs, Joseph D. Oliver, Jr., Samuel W. White, Alva W. Phelps, A. King McCord, Carl L. Hecker, B. Haugen, William J. Fisher. Chairman of the Board Phelps was absent on a tour of the Oliver Asian



The Oliver Super 55 diesel engine. It is of 4-cylinder design, displacing 144 cu. in., bore 3½-in., stroke 3¼-in. and developing its rated power at 1750 rpm.

territory. David B. Stout, Be-Ge vice-president and general manager, welcomed visitors to the plant.

The switch to diesel for western farmers who, unlike the farmers of the mid-west and east, are already diesel minded, was a wise move. The wheel tractors displayed were: Super 55, Super 66, Super 77, Super 88, Super 99, and the Super 99GM.

The Oliver crawler line also showed a half dozen models. All were diesel except the little OC3. The OC6 orchard-type, with low seat to allow the operator to duck under tree limbs, was a new one not yet in production. It quickened the hearts of every dealer in the fruit and nut tree areas. Other crawlers in the line were the OC12, DDH and OC18.

The latter was seen by this writer in Arizona early in 1954 when the first one had just arrived and gone out to do a heavy plowing job. It was turning up wash-boiler-size chunks of hard ground to reclaim a rich valley farm 75 miles east of Phoenix.

When Oliver bought Be-Ge to get this western factory and its line of dirt-moving and land-levelling equipment, it also got that lusty firm's hydraulic control development and patents. The name Be-Ge came with a partnership between Al Gurries, the original founder, and Jim Bussert, an old friend, owner of the welding shop where Gurries had his first scraper built.

The Be-Ge plant gave Oliver a California-bred and proved factory with a reputation for turning out rugged land-shaping equipment as well as leadership in hydraulic control development. The plant's location in northern California gives Oliver a strategic location to tap the growing export business and to reach some of the fastest growing population areas of the U.S.

Agricultural engineers agreed with the writer's opinion that the new dieselized self-propelled combine Oliver showed would immediately bring competitive dieselized self-propelled combines to U. S. grain fields. At present, all diesel engines on both Oliver's wheel and crawler tractors as well as on the self-propelled combine are Oliver, developed by Oliver's engineers who have had nearly a quarter century of diesel experience. Oliver started with a few Lanova engines in wheel tractors for California asparagus and orchard farming about 1937. The Oliver crawlers, of course, have about 20 years of background of Hercules diesels. All of the present line have been put through the Nebraska tests or are now going through them. In 1947 and 1948, Oliver introduced their new fleet line of tractors called the 66, 77, and 88. The 88 was introduced first, followed by the 77 and the 66. The tractors had years of experimental testing before they were introduced and were designed around common parts wherever possible to provide a low-cost diesel for all these tractors. The original displacements were 231 cu. in. for the 6-cyl. 88 diesel, 194 cu. in. for the 6-cyl. 77 and 129 cu. in. for the 4-cyl. 66 engine. In 1954, the Super 55 tractor was introduced employing the same basic engine as the 66 but with higher speed and greater displacement. The 66 runs at 1600 rpm with dis-

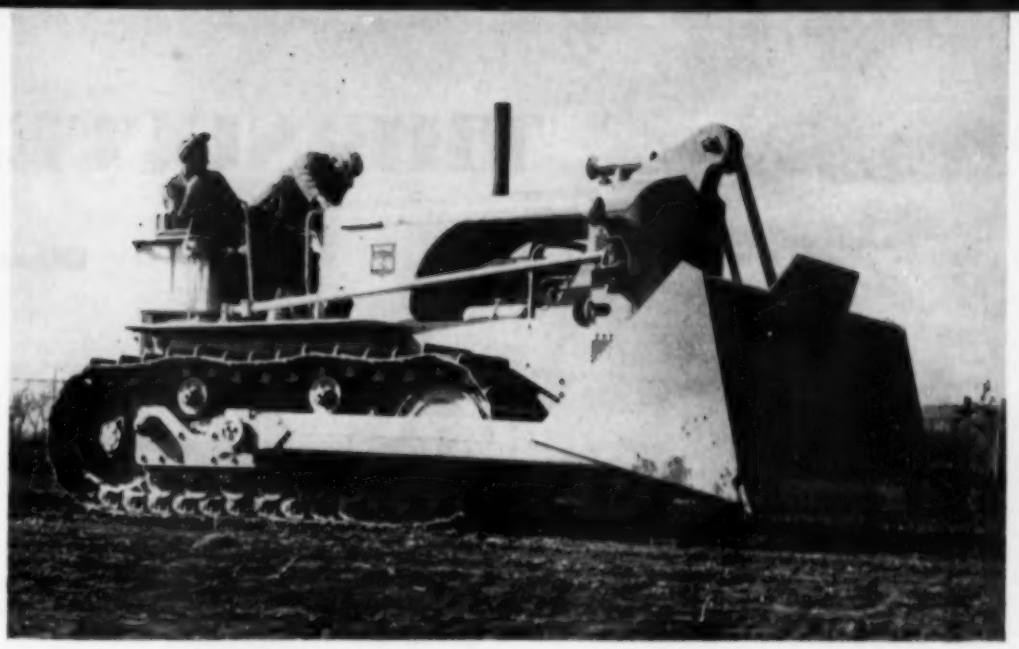
The Oliver crawler tractor line-up at the Gilroy show. All are powered by diesels except the tiny OC-3 at the far right.

placement of 129 cu. in. The Super 55 engine operates at 2000 rpm with a 144 cu. in. displacement. The introduction of the Super 66, Super 77, and Super 88 followed the introduction of the Super 55. The Super 66 tractor engine is basically the same as the Super 55 except for the assembly of accessories. The Super 77 has 216 cu. in. displacement and the Super 88 has 265 cu. in. displacement.

The Oliver diesel combustion chamber conforms to the Lanova system which has good inherent turbulence and complete combustion characteristics. It also lends itself to ease of starting and provides for lower peak combustion pressures to permit greater interchangeability between crankshaft bearings, and connecting rods with their gasoline counterparts. Oliver executives say this makes an economical diesel—to buy and to operate—and accounts for the fact that more than half of Oliver's tractor production is the dieselized product.

The crankcase is a rigid, one-piece design, heavily-ribbed and ventilated at the top of the rocker arm cover. The cylinder liners are the wet type, removable, nickel iron. Oliver claims these features give uniform cooling the full length of the piston stroke and make for easy engine reconditioning. The crankshaft is a high-grade steel forging with heat-treated journals and fillets rolled to assure long life and excellent wearing qualities. The Super 55 and Super 66 engines have counterbalanced crankshafts because they are 4-cylinder engines and operate at higher speeds. The crankshaft for the Super 77 and Super 88 are not counterbalanced because of the general construction system—they are 6-cylinder engines and maximum speed is 1600 rpm.

Pistons are aluminum alloy with full floating pin and three compression and one oil control ring. Cylinder heads are special cast iron and one piece design. The port design assures unrestricted air inlet and scavenging. Valve parts are lubricated through Oliver's metered oil lubrication system. The fuel injection system is the American Bosch single plunger with single orifice pintle type nozzles. A diaphragm type pump assures the fuel supply. The starting system is 12-volt electrical. For cold weather, an electrical heater coil is located in the air intake system.



Oliver's big unit is this OC18, shown here with a Be-Ge bulldozer. It develops 133 hp drawbar by the Nebraska test.

The Oliver Model 33 combine. This dieselized unit was developed by Oliver engineers to fill what they consider to be an important gap in farm machinery.

This Oliver 55 is shown working on a 3-bottom Oliver gang plow doing a seedbed job.

THE SUCCESSFUL BURN

Diesel Engine Manufacturers' Associatio
for the Handling and Util

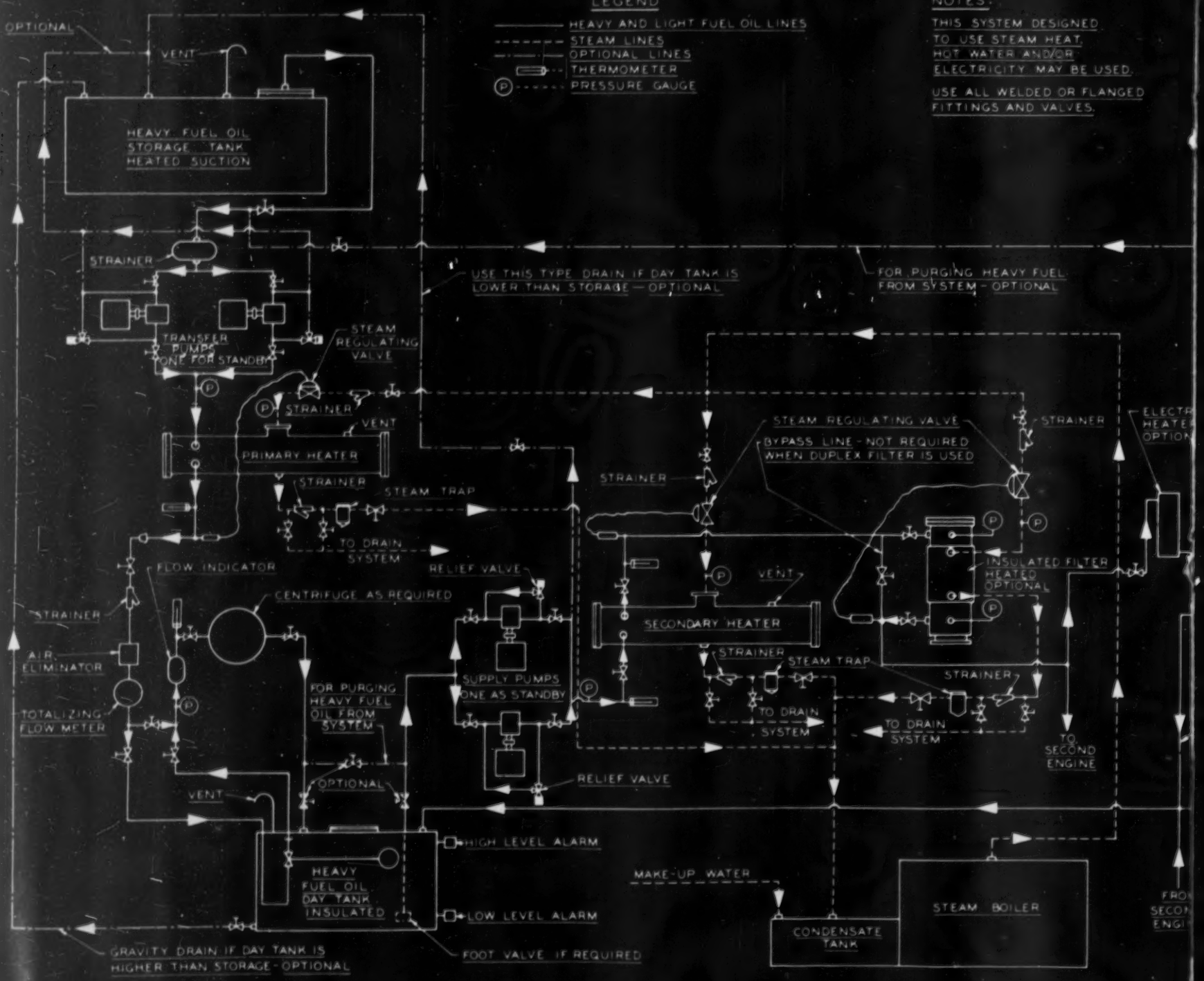
THE burning of residual oils, Nos. 5 or 6, or bunker fuels, is being done successfully in many installations. Refining processes have been perfected to such a degree that for economic reasons there has been a tendency for more and more new, as well as existing diesel plants, to investigate the lower operating costs associated with using a cheaper grade of fuel.

The layout below shows a typical basic piping diagram for a residual fuel oil system. Although steam heat generated by an oil fired boiler is used to heat the oil, electricity may be employed, or if the oil is not too viscous, hot water from the engine jackets may be utilized. In any event it is advisable to use thermostatically controlled heat to prevent fluctuations in viscosity.

The system may be divided into two stages: (1) between the storage tank and day tank; (2) between the day tank and engine. Each of these stages will be discussed.

It is generally advisable to provide a heated suction in the storage tank if the plant is located in a section of the country where the am-

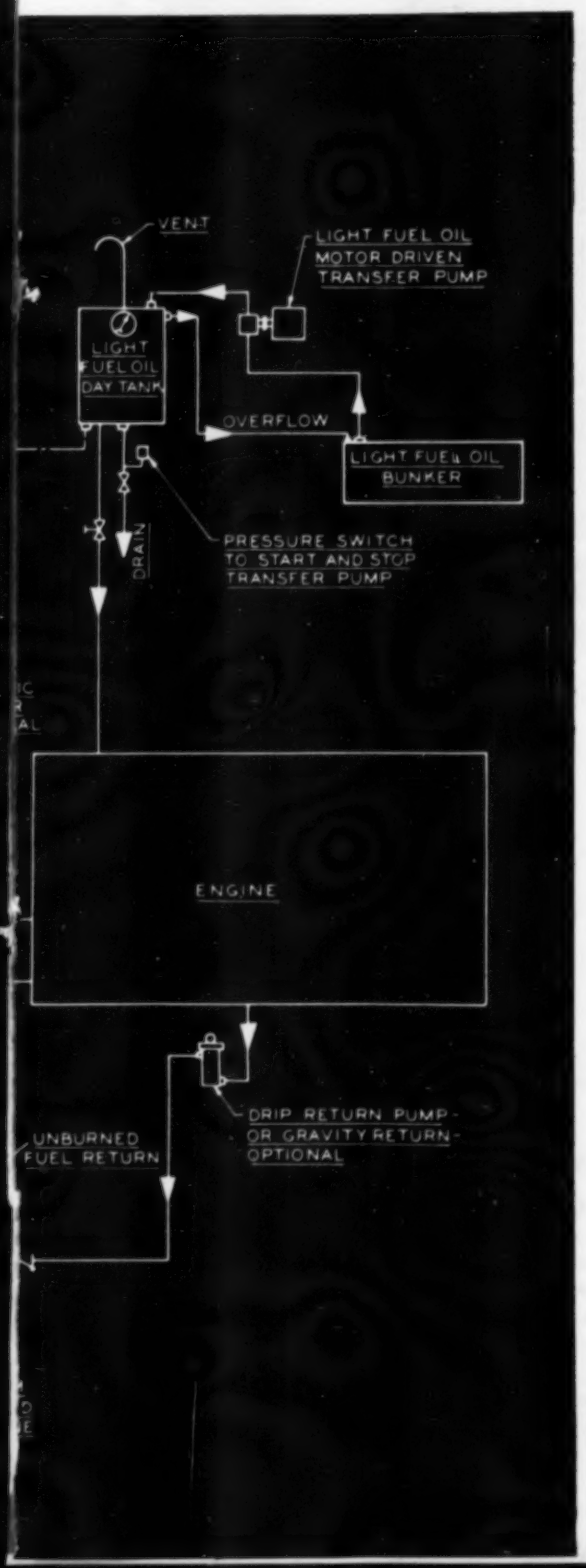
D.E.M.A. recommendation of a typical basic piping diagram for a residual fuel oil system.



N ING OF RESIDUAL OILS

iatio n Recommendations and Specifications
Util ization of Residual Fuels

bient temperature is such that a viscosity between 2000 and 5000 SSU cannot be maintained. Heat may be in the form of low pressure steam or hot water, but precautions should be taken to prevent any leaks in the heating system inside the tank. A fuel transfer pump operating continuously, with a spare unit as standby, discharges oil through the primary heater, centrifuge and to the day tank.


VENT
LIGHT FUEL OIL MOTOR DRIVEN TRANSFER PUMP
LIGHT FUEL OIL DAY TANK
OVERFLOW
LIGHT FUEL OIL BUNKER
DRAIN
PRESSURE SWITCH TO START AND STOP TRANSFER PUMP
ENGINE
DRIP RETURN PUMP - OR GRAVITY RETURN - OPTIONAL
UNBURNED FUEL RETURN

A heated day tank is not necessary if it is insulated. The centrifuging temperature is maintained such that the viscosity range is 100 to 250 SSU for best results. The level in the day tank is controlled by a float actuated valve which permits the centrifuge to purify only the amount of oil the engine consumes. Centrifuging at such a slow rate increases the efficiency of operation. The centrifuge is shut down for cleaning as required, and as added protection a standby centrifuge may be used if the expense is warranted.

In the second stage of the system the oil is heated and filtered. A standby supply pump is recommended. The supply pump discharges through the secondary heater, filter, electric heater, and then to the engine. Temperature of the oil from the secondary heater should hold the viscosity in the range of 50 to 150 SSU for proper operation of the injection pumps and injectors. An insulated filter is necessary and although provisions for heating is optional it has been found advantageous when first placing the system in operation or after shutdowns. The electric heater is also optional and may be dispensed with if the filter is heated.

Provisions have been shown for draining the heavy fuel oil day tank and purging the complete heavy fuel oil system with light oil by using only existing equipment. This is advantageous if the heavy oil system is shut down for any length of time as the heavy oil will congeal, causing considerable damage and expense.

The size of the various pumps, heaters, centrifuges, filters, etc., will depend on the amount of heat available, specifications of residual oil being used and amount consumed. Detailed specifications of the residual oil proposed should be submitted to the engine builder who will make recommendations as to suitability and proper cleaning means. The engine should always be started and stopped on light oil. Before shutting down, the unit should operate on light oil until all the heavy oil in the piping on the engine has been consumed.

Although the diagram is based on a one engine installation, it is possible to serve additional diesel units by the application of pressure regulating valves to maintain a constant pressure in the heavy oil supply header.

RESIDUAL FUEL SPECIFICATION DATA

API Gravity at 60 F.: The API gravity of a residual fuel may vary from as low as 3 or 4 to perhaps 14 or 15 for No. 6 fuel and from 13 or 14 to perhaps 19 or 20 for a No. 5 fuel. Gravity has little effect upon the fuel as a fuel but can be used as a guide to indicate to some degree the general quality of the fuel as well as its weight compared to water. Fuels below 10 API gravity are heavier than water at 60 F. and those above lighter than water. Gravity cannot be correlated with viscosity. It is desirable to select one that is lighter than water.

While it is desirable to use the lighter grades of residuals, it does not necessarily hold that a heavier grade would not make a good fuel. A low gravity fuel of low viscosity could be a good fuel providing other attributes of the fuel are satisfactory. As a general rule, however, the heavier fuels are those that have been cracked down further with the result that they are more viscous and have a greater concentration of dirt and a higher carbon content.

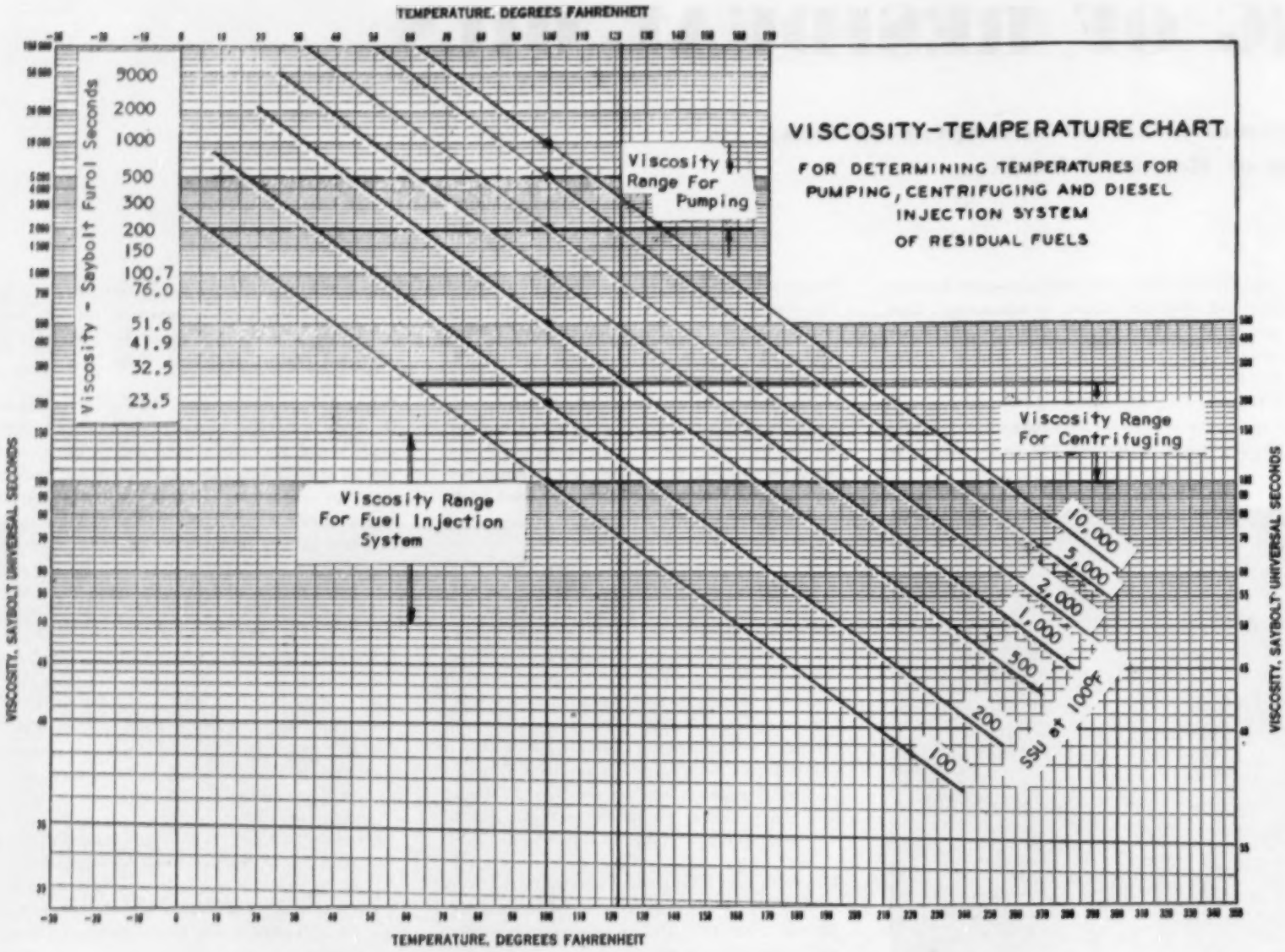
Viscosity: The ASTM specification for fuel oils, D396, has established viscosity limitations for No. 6 fuels at from 45 to 300 SSF at 122 F. and for No. 5 fuels at from 40 SSF at 122 F. to 150 SSU at 100 F. When used for diesel fuel, the less viscous ones should be selected, if available, as lower temperatures and less heat is required to bring them down to suitable operating viscosities.

Conradson Carbon: There is no established limit in a residual fuel for Conradson Carbon. The percentage in a fuel depends on several factors—the crude source, refining process, how far the residual has been cracked down, etc. Conradson Carbon percentage can vary from as low as 1 or 2% to 17 or 18% or even more. Conradson Carbon affects the operation of a diesel very little in the lower concentrations. Higher concentrations of carbon may under some conditions cause a smoky exhaust. Specific fuel consumption may be affected by the presence of excessive Conradson Carbon.

Sulphur: Sulphur in a fuel affects engine wear. It is well in selecting fuels to select those that have low sulphur contents. Much can be done, however, to combat the effects of sulphur by good operating practices. Sulphur in burning is changed to an oxide which in itself is quite free from corrosive effect. It is only when water is present in the fuel that harmful, corrosive sulphuric or sulphurous acids are formed.

B S & W: According to the ASTM D396 specification, water and sediment is limited to 2% with the amount of sediment by extraction not exceeding .05%. To establish any specified limits below this standard would mean premium fuel prices. In selecting fuels for use in diesel engines, selection of those fuels that contain a minimum of B S & W will lighten the work that the centrifuges have to do as well as reduce their maintenance.

Ash After Centrifuging: The percentage of ash after centrifuging is a figure that is subject to wide variation. After centrifuging, the remaining ash is, if the centrifuging has been efficient, soluble ash



Notes and additional explanatory material for this viscosity-temperature chart are outlined below. The chart is printed by courtesy of the American Society for Testing Materials.

and little can be done economically to reduce it. It is reasonable to expect an ash in the fuel after centrifuging of from .01 to .05%.

Flash: The flash point is one that needs little discission because it is generally established by law at some minimum. The ASTM minimum is 150 F but residuals seldom reach down this low.

Vanadium and Vanadium Pentoxide: Vanadium or Vanadium Pentoxide appears in most residuals to a greater or lesser extent. Vanadium of 70 ppm or Vanadium Pentoxide of 125 ppm should be considered the maximum. In choosing fuels for use in diesel engines, those containing minimum amounts of Vanadium or Vanadium Pentoxide should be selected.

NOTES FOR VISCOSITY–TEMPERATURE CHART FOR RESIDUAL FUELS

The viscosity of a residual fuel is a very important factor because a residual fuel must be preheated to temperatures which correspond to certain viscosities in order to be able to pump the fuel oil, clean it efficiently and inject it into the diesel engine.

In the United States viscosity for residual fuels is ordinarily measured by the Saybolt Universal Viscosimeter in seconds (SSU) at 100°F. or by the Saybolt Furol Viscosimeter in seconds' (SSF) at 122°F. for fuel oils with flow times of more than 25 seconds Furol. The viscosity chart is a means for determining the viscosity of a fuel oil at various temperatures. The rate of change in viscosity varies with different fuel oil. In order to obtain exact values for the viscosity, it would be necessary to have the viscosity taken at two temperatures, this second reading preferably at 210°F. The viscosity chart is made for average rates of changes in viscosity and is satisfactory for most cases. It also shows limiting viscosities for pumping, centrifuging and fuel injection.

The upper limit for being able to pump fuel oil is at a viscosity of 2000 to 5000 SSU. The usual range of viscosity for centrifuging is between 100 and 250 SSU. The best centrifuging viscosity and temperature depend on the type of fuel oil and on the plant arrangement. The viscosity of the residual fuel at the injection system varies between 50 and 150 SSU. The desirable viscosity depends on the particular design of the engine.

The instructions of the engine manufacturer should be followed for recommended viscosities and temperatures at the centrifuges and at the fuel injection system.

Editor's Note:

This article consists of material contained in Chapter 10 of the Diesel Engine Manufacturers' Association "Standard Practices." The article contains the full recommendations and specifications in the handling and utilization of residual fuels as outlined in this section. We feel that this information is important enough to bring to you, our reader, in complete detail.

DIESEL-GENERATORS HELP WILDING SHOOT COLOR ANYWHERE, ANY TIME

By RICHARD B. ESPEY

Twin Buda diesel-generators are mounted on this Fruehauf trailer, pulled by an International truck in which other lighting and motion picture gear is carried.

Here the mobile generating plant is pictured during filming of a motion picture on the trading floor of the Chicago Board of Trade. Parked in the busy Chicago Loop, the diesel-electric sets can provide for either arc or incandescent lighting. The twin Budas can deliver a maximum of 275 kw of dc current.

A twin diesel-generator set, providing an independent and mobile source of power, helps Wilding Picture Productions, Inc., shoot industrial color movies anywhere, any time. Wilding, whose headquarters and main studio are in Chicago, is a leader in the business film industry. Its films are made for all types of American industries, for education and for the government. "Stars" in Wilding pictures are products and processes; much of its work is done on location in the industrial plant.

To do the job right, Wilding officials sought a source of dc power in sufficient quantity to make crews independent of local conditions. Accurate control and ability to travel and operate anywhere in the U.S. were also needed. The answer was found in a Buda diesel-electric generator set which develops a maximum of 275 kw of dc current.

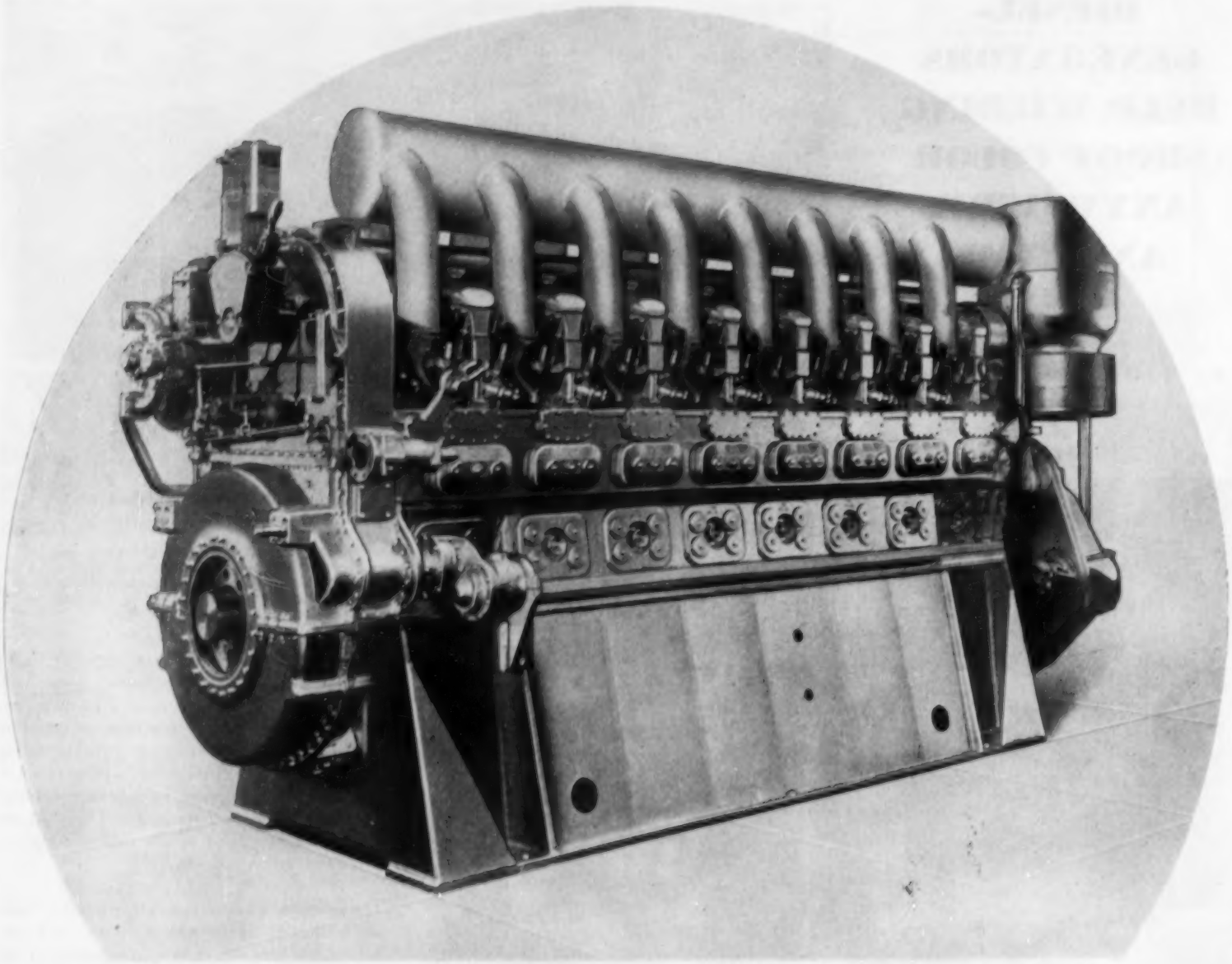
The set is mounted on oil field skids on a Fruehauf flat bed trailer and is drawn by an International Harvester truck. The truck carries lights, cables and other paraphernalia needed by the crew. Each of the generators is powered by a Buda Model 8 DCG-1290 diesel of 1290 cu. in. displacement, operating at 1800 rpm to produce a rated 138 kw, or 125 on a continuous basis. The eight-cylinder engines have a 5⅝-in. bore nad 6½-in. stroke. Fuel is fed by means of a mechanical solid injection pump, with amount automatically controlled by a governor.

The dc generators are single ball-bearing, self regulated, rated at 40°C temperature rise. Output controls are located on a panel at the rear of the set on the trailer. Operation of these controls during shooting of a picture is essential to accuracy in current requirements, with needed voltages ranging from 32 to 140.

The importance of this mobile power plant to Wilding is explained by company officials who point out that the modern trend in construction of industrial buildings calls for greater skylight and glass wall areas. There's a lot of daylight where artificial light was formerly found. Work with color film doesn't permit mixing the two types of light. The practical solution is in the use of arc lights which provide a color "temperature" approximating daylight. These arcs consume a lot of dc current and that's where the generator set comes in. Variations in the amount of light required during the shooting also call for quick, accurate control. Usually a scene is opened with an "establishing" shot which takes in everything and uses all the available lights. Then as the camera moves in closer, less current is required.

The generator set came in handy in a recent Wilding production for the Chicago Board of Trade. Part of the film was to be photographed in the trading room—almost three stories high and one of the largest single rooms in the world. Initial surveys showed that attempts to use available power might result in blown fuses and serious delay in operation of ticker services and other wire equipment linking the Board with trading centers throughout the world. Availability of the diesel-generator set (which could be parked on the street below) permitted production of the picture with adequate lighting and without hazard to normal trading operations.

The twin feature of the set permits operation of either one or both diesels, depending on output required. Maintenance of the equipment is handled by the same man who operates the diesels during the shooting. He sees that the engines are run once a week, and handles 500-hour checks, replacement of injectors, filter cleaning and such servicing. Engine noise prevents normal "sound" shooting. Sound-proofing of the units was considered but ruled out because of the expense. Now, if it is essential to shoot sound with the generators in nearby operation, this sound is used only as a guide. Final sound is "re-made" in the studio. The generator set has been worked at distances up to 600 feet from the shooting, but Wilding attempts to hold this distance down to 300 feet to avoid excessive line drop.



This is General Motors' first turbocharged 2-cycle, V-type engine—the Model 16-498. It will be offered in four sizes—six, eight, 12 and 16 cylinders. Each cylinder is rated 175 bhp. Bore is 8¼ in., stroke, 10½ in. A De Laval turbocharger is used. The governor is Marquette.

CLEVELAND DIESEL'S NEW TURBOCHARGED 2-CYCLE, V-TYPE ENGINE

Designed To Meet The Need For Greater Horsepower, The Engine Will Be Displayed At The General Motors Powerama In Chicago

THE announcement of the first General Motors turbocharged 2-cycle V-type diesel engine was made recently by Thomas E. Hughes, General Manager of the Cleveland Diesel Engine Division of General Motors. This engine is particularly designed to meet the increased demands for greater horsepower by the marine and industrial markets.

The public will see this engine for the first time at the General Motors Powerama in Chicago, August 31 to September 25. It is a result of intensive development and refinement of Cleveland Diesel's 2-cycle engines. It has a bore of 8¼ in. and a stroke of 10½ in. and will develop 175 bhp per cylinder. It is available in 6, 8, 12, and 16-cylinder sizes. A turbocharger made by De Laval Steam Turbine Co. is used. As in its other engines, Marquette governors are standard.

In making the announcement of the new engine, Mr. Hughes pointed out there are four distinct advantages which are of tremendous importance to the fields of diesel application. He said that the features of this engine are lower initial and installation costs per horsepower, fewer working parts per installed horsepower, lower operating costs because of higher efficiency, and much lower maintenance expense per horsepower. Furthermore, he

said that the new Model 498 engine, as compared with a non-turbocharged engine, develops 60% more horsepower per cubic foot of engine volume and the horsepower per pound is increased by the same percentage.

The turbocharged engine, in a series of tests, has a flat fuel rate curve from 50%-100% at any operating speed. Furthermore, these tests have shown, by arranging the exhaust-driven compressor in series with the engine-driven positive displacement blower, that the acceleration is exceptionally good with a clear exhaust. At rated speed, the fuel consumption is .360 lbs. per bhp/hr, and .380 lbs. per bhp/hr maximum fuel consumption from 50% to 100% of the horsepower range. The lube oil consumption is .02 gals. per hour per cylinder or more than 6000 bhp/hrs. per gallon at rated brake horsepower. It has also been determined throughout the tests on this engine that it is free from any appreciable torsional vibrations over the entire operating range. By turbocharging a thermal efficiency of 36% has been attained.

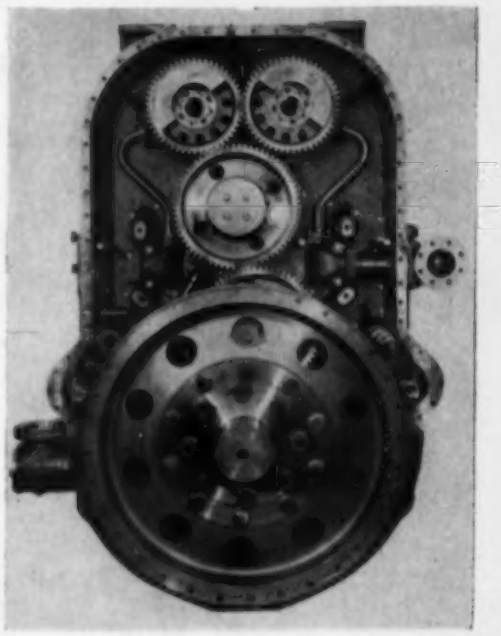
All engine parts are readily accessible for inspection or removal and therefore cylinder heads, pistons, and liners can be serviced individually with greater ease. The advantage is furthered by improved location of fuel and lube oil piping. The crankcase is designed so that all welds are stressed less than 5000 psi, indicating a generous factor of safety. All stress welds are designed for continuous submerged arc welding. The crankcase itself is stress-relieved and shot-peened to reduce stress concentrations. Removable fretting rings between cylinder liners and the crankcase eliminate "wear out" of the crankcase during the life of the engine.

Furthermore, no coolant water is in contact with the crankcase, which eliminates crankcase corrosion. Provision has been made for spherically-seated cylinder and main bearing bolts, thereby eliminating studs. Serrations at the main bearings and caps make locating dowels unnecessary.

Crankpins and main bearing journals, which are induction hardened to 50 Rockwell "C," are of adequate size to assure reasonable bearing loads. The use of steel back, lead-bronze bearing shells, with lead-tin overlays, makes crankshaft wear negligible. The camshaft, camshaft bearings, rocker arms, rocker arm bearings and rollers are of ample size, assuring rigidity and durability.

Separate piston cooling by oil spray jets assures that low piston temperatures are maintained. Through drilled connecting rods, the wrist pins are lubricated by force-feed lubrication. The wrist pin and bushings are of ample size to withstand the additional firing pressure due to turbocharging, and the connecting rod is of rigid design with a strap construction at the crankpin and for easy removal. A hardened steel sleeve is used in the connecting rod eye to prevent wear on the rod proper. A floating type piston is used with Ferrox filled compression rings to increase piston ring and liner life, and to obtain complete piston symmetry and uniform thermal stress distribution.

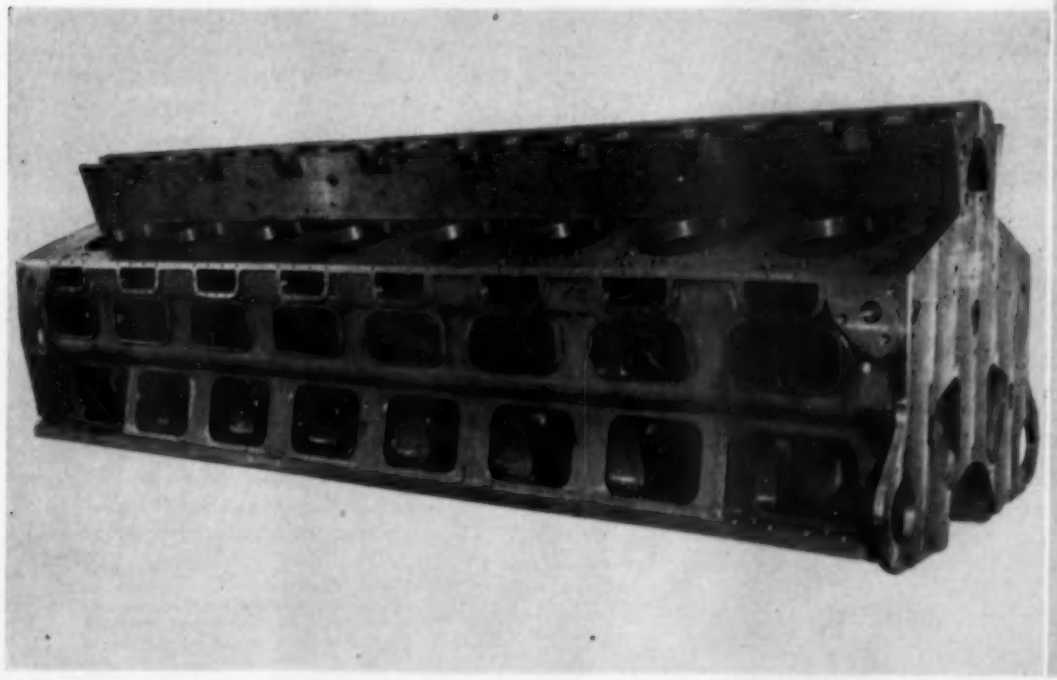
The cooling passages in the cylinder heads have been designed to make certain that symmetrical water flow is obtained through the heads and liners. The exhaust valves operate at a low temperature as a result of the tremendous air cooling effect due to turbocharging. Stronger, wear-resistant cylinder liners of newly patented titanium alloy cast iron have been developed to reduce cylinder liner wear to a minimum. The result has been a great improvement in the life of both cylinder liners and piston rings, and also in lube oil consumption. The overall noise level of this turbocharged engine is considered to be very low.

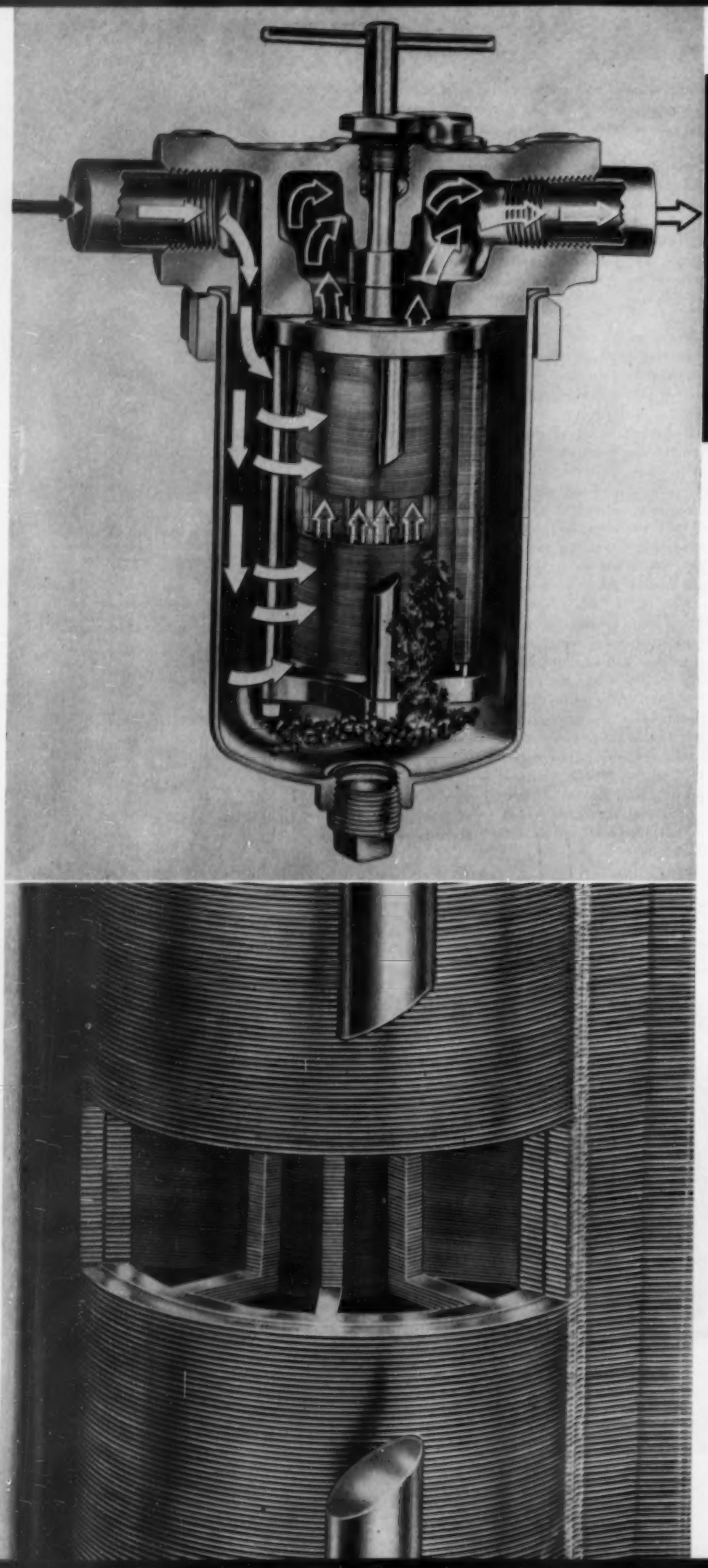


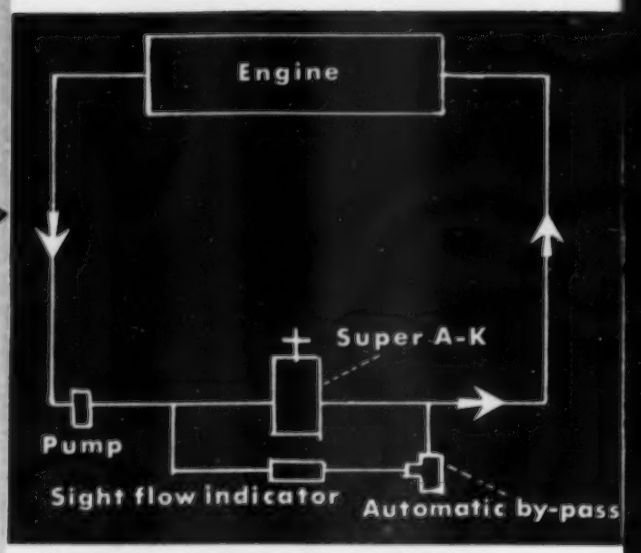
The gear train is described as having new and simplified design spur gears with spigot-type journals.

Cylinder liners are said to be stronger, more wear-resistant, and they are of titanium alloy cast iron construction.

The crankcase on the V-type turbocharged Cleveland Diesel is of new design. It is stress-relieved and of welded steel construction. No coolant water comes in contact with the crankcase.







Three arrangements are possible when installing the new Cuno Super Auto Klean filter. Diagram above shows this filter used alone with either a built-in by-pass valve or an external one with a sight flow indicator.

THE Cuno Engineering Co., Meriden, Conn., announces a new oil filter of "revolutionary design" for edge filtration. It is for use on both large, slow-speed and small, high-speed diesel engines. A refinement on the well-known Cuno Auto-Klean Filter, which has been serving the industry for many years, giving positive filtration by passing a fluid, containing solids, between strips of metal placed edgewise to the flow. The strips are separated by a spacer of pre-determined thickness. Therefore, solids larger than the spacer cannot pass between the strips.

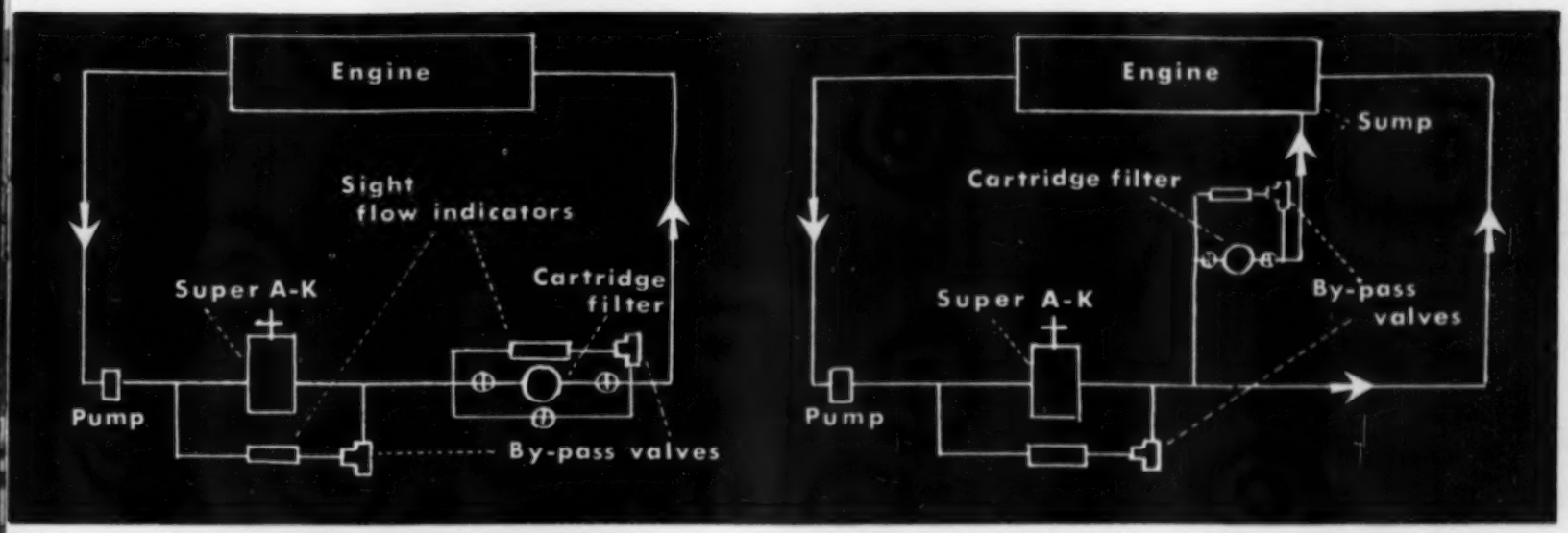
In the new Cuno Super Auto-Klean Filter, the spacer is replaced by a wheel-shaped minor disc. Major and minor discs are stacked on a center support rod. The diameter of the minor disc determines the degree of filtration that is to be obtained. (See diagram A for positioning of major and minor discs.) Fixed alongside the stack of discs is a stationary rod holding a plow-shaped cleaner blade, which extends into the slots between the major discs. (See diagram A.) You will note that this cleaner blade also rides on a floating rod. This feature affords cleaning in either direction with a twist of the handle. The stack of discs is closed at one end with the opposite end connected to the filter discharge.

The new Cuno filter of 2¼ in. diameter and 8 in. length, filtering oil at 200 SSU viscosity at 160°F., can assure full flow 40 micron filtration, the company states, with these flow and pressure drops:

Pressure Drop	*Flow*
3 psi	25 gpm
5 psi	35 gpm
7 psi	40 gpm

The Super Auto-Klean Filter has been on test for more than a year, and Cuno already has around a thousand advance orders for it. Company officials claim the following features: full flow micronic

These illustrations show a cutaway view and a close-up detail on the new Cuno filter. It is designed for both large, slow-speed and small, high-speed diesel engines.



In the above arrangement, Cuno engineers recommend an external sight flow indicator and by-pass valve on a cartridge filter, and either a built-in or external flow indicator and automatic by-pass valve on the Super A-K.

The third arrangement utilizes the Super A-K with a small by-pass cartridge filter. For the cartridge, an external by-pass and sight flow indicator are recommended, although the internal by-pass may be satisfactory. Either a built-in or external by-pass around the SAK can be used.

CUNO ANNOUNCES NEW FILTER

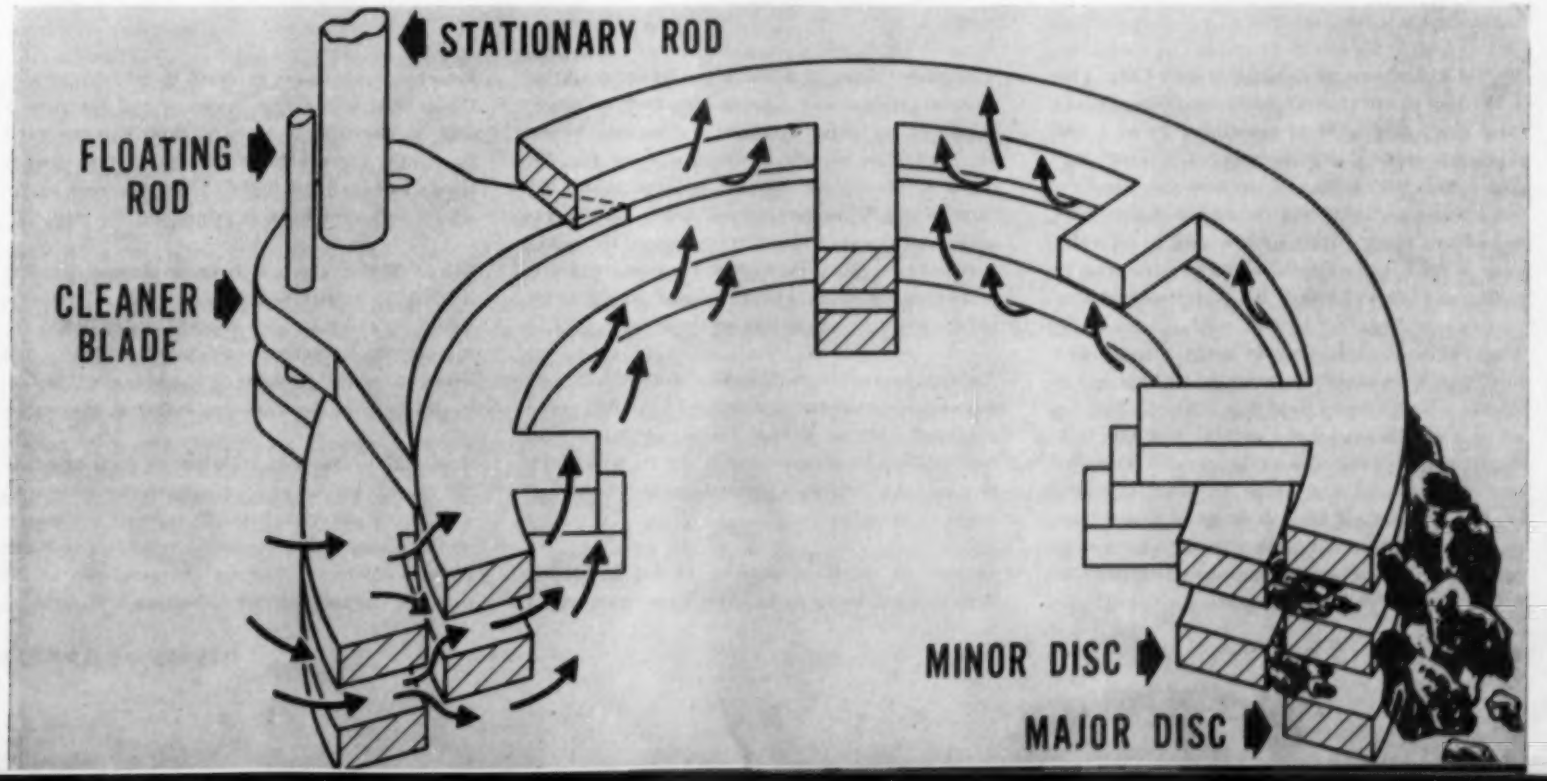
By R. K. McQUISTON

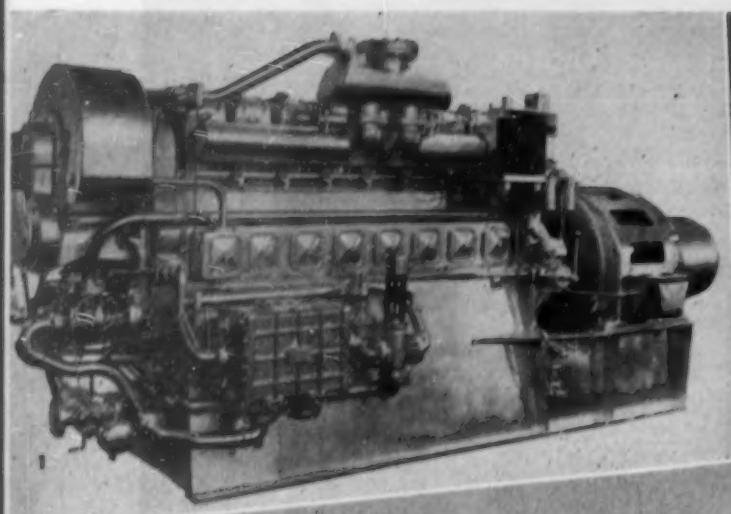
filtration with a self-cleaning filter; no cartridge changes; no pressure drop build-up, thus saving pumping horsepower; positive engine protection of 40 microns and finer. The manufacturer also states there is no need to use large, expensive cartridge filters since oil can be kept in top condition with small, inexpensive, by-pass or shunt-type cartridge filters. This offers low maintenance, Cuno executives say, because their filter will eliminate the need for the engine's cartridge-type filter to remove any particles larger than 40 microns. Also, the officials say their tests show that no duplex units are needed. "The Super Auto-Klean handles full flow all the time. One by-pass cartridge filter can be isolated for cartridge changes and the engine still is protected by a 40 micron Super Auto-Klean filter. The new filter cannot absorb or adsorb additives from the oil because of the all-metal construction. It is interchangeable on engines now equipped with standard Auto-Klean filters. The new filter can be adapted to any existing engine by simply installing the filter in the lube oil line following the discharge of the engine pump.

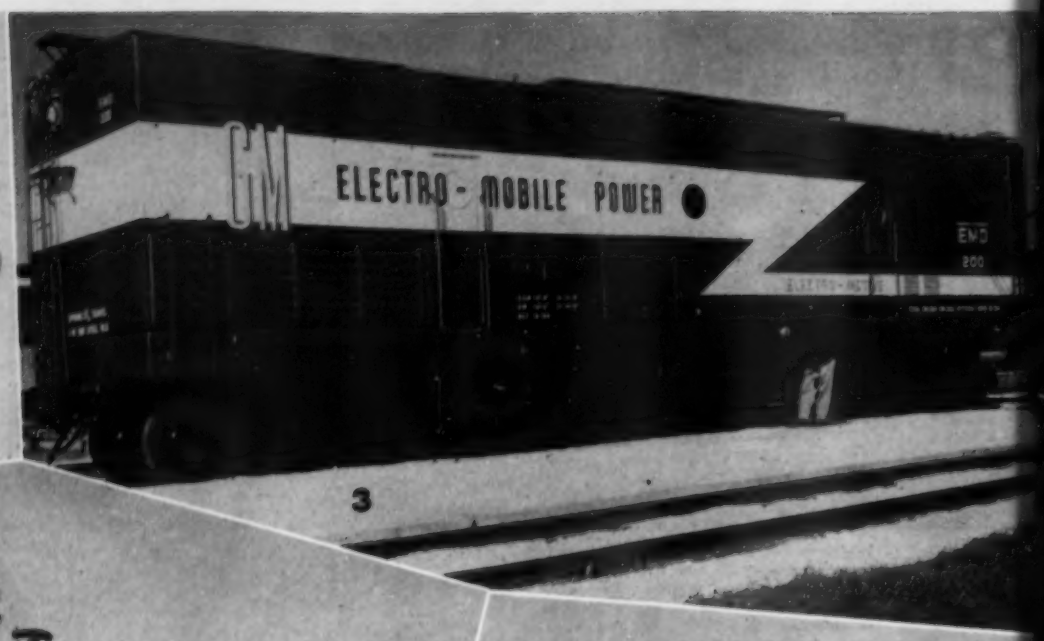
"The Super Auto-Klean's permanent, all-metal filter element resists corrosion and abrasion," a Cuno official added. "This assures exceptionally long, trouble-free service. Our new filter can be cleaned continuously with motor drives, or it will clean itself by intermittent manual turning of the handle. Our small unit provides high capacity, and this results in low installation cost. The size of our new filter enables an engine owner to conserve floor space. This is especially important in most cases where small, high-speed engines are in use. We can now offer their owners full flow lube oil protection down to 40 microns and finer, at low cost, and in a minimum of space."

The cartridge pictured here is 2¼ in. in diameter by 8 in. long. A cartridge 2¼x5 in. also is in production, and Cuno says other lengths can be made where demand dictates. Both larger and small diameters are contemplated but at present only the 2¼ in. size is in production. Housings are available which will accommodate up to four standard cartridges, giving flows in the order of 100-150 gpm with oil at a viscosity of 200 SSU.

Diagram A. This shows the positioning of the major and minor discs. The difference in diameters of the major and minor discs determines the degree of filtration obtained. Also shown is the plow-shaped cleaner blade whose combing action is a unique feature of this new filter.







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1. Cleveland Diesel Engine Division will exhibit several engines including this Model 8-268A generator set, many of which have been installed by Westinghouse Electric in telephone exchanges as standby units. 2. Powerama visitors can go aboard the *Lawrence C. Turner*, said to be the largest tug on the Great Lakes. 3. One of Electro-Motive Division's displays on rails will be this mobile, emergency 1000-kw diesel-electric generating plant. Visitors will be able to start and stop the unit by speaking into a "walkie-talkie" phone. 4. Powered by a Cleveland Diesel, the "Terrible T" played havoc with Japanese shipping during World War II. It will be open to Powerama visitors.

POWERAMA VISITORS TO SEE VALUE OF DIESELS

By BRUCE WADMAN

NINE divisions of General Motors Corp. play host to the general public on Chicago's lake front from August 31 to September 25 in a free exposition called the "Powerama." The show's purpose is to help Americans learn how diesel and gas turbine engines are giving the nation new muscles to build its roads, cut its timber, drill its oil wells, plow its fields, propel its ships and aircraft, drive its trains, and otherwise turn the wheels of industry.

The Powerama will provide many visitors with their first opportunities to observe the huge size of various kinds of equipment that is powered by diesel engines. Because of the number and variety of displays, the public should be greatly impressed with the importance of diesels. In addition, several of the exhibits have been so designed that the impact on the public will be even greater, for visitors will be invited to operate the units as if they actually were diesel-driving experts.

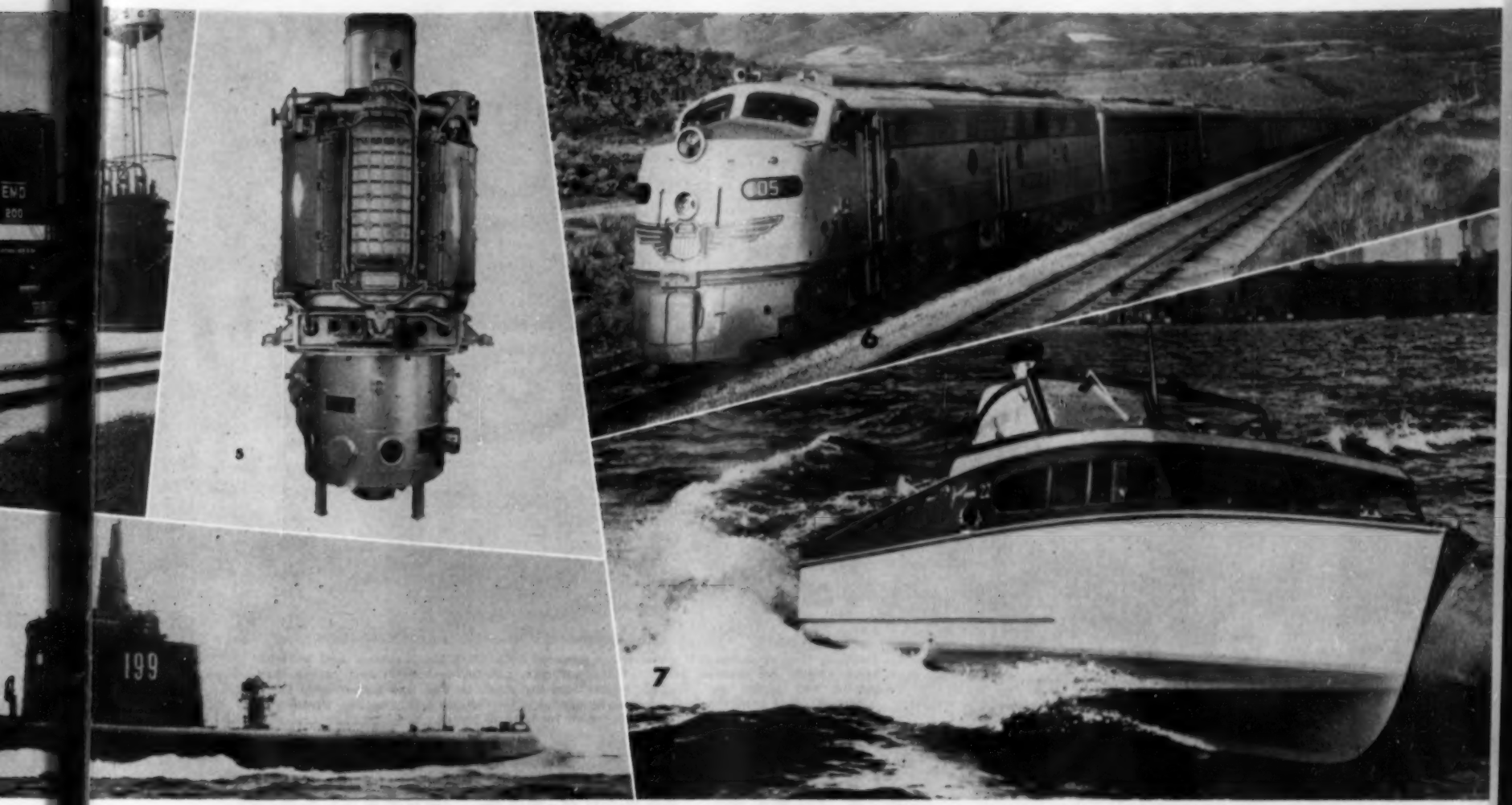
A simulated drive in a 50-ton Euclid ore truck, as used on Minnesota's famous Mesabi iron range, is one of the thrills planned for visitors. When the guest seats himself in the cab of the Euc, he seems to be on the floor of an iron mine. He "drives" the diesel dump truck 300 ft. up adverse grades, using a mechanical transmission. He makes a second run, using the Allison Torqmatic converter and transmission. The advantages of the latter are supposed to be obvious to the novice.

Another spectator participation exhibit will permit visitors to operate a dieselized Link-Belt crane equipped with an Allison Torqmatic. An 8000-lb. ball will first be maneuvered by the friction clutch method, and then with power transmitted through a torque converter.

Because of the long-standing public fascination with railroad locomotives, even larger numbers of Powerama visitors are expected to get even greater thrills from sitting at the controls and operating a 2400-hp passenger locomotive. Built and exhibited by GM's Electro-Motive Division, the driving trucks will be lifted slightly above the rails so the wheels will turn without propelling the engine.

Electro-Motive also will have in operation an oil drilling rig similar to the one placed in service in Louisiana recently. (See DIESEL PROGRESS for August 1955.) Steel-helmeted, highly-skilled "rough necks" from the oil fields of Louisiana will be imported to make this display as authentic as possible.

The exhibit that will be inspected most minutely by transportation and manufacturing executives will be the all-GM lightweight train. It will consist of 10 coaches and a one-unit Electro-Motive diesel engine—capable of carrying 400 passengers at 100 mph for sustained stretches. Various GM divisions



5. Cleveland Diesel builds vertical engines like this for submarine service. Several will be on display. This Model 16-338 generator set has 16 cylinders, 6 in. bore and 6½ in. stroke. After visitors have viewed such engines, it is believed by GMC officials that the public will have greater appreciation for the role of diesels in America's progress.

6. A new 2400-hp passenger locomotive, similar to this one on the Union Pacific, will be a part of the Electro-Motive Division's exhibit. Guests will be able to operate the engine—with the wheels lifted slightly above the rails. Also on exhibit will be the revolutionary GM lightweight train, a diesel locomotive and 10 coaches. 7. One of the smallest cruisers with a diesel engine, the *Jimmy D IV* will be one of GM Detroit Diesel's entertainment offerings at the Powerama.

contributed engineering skill and more-or-less standard products to build this ultra-modern train. The purpose was to incorporate some new thinking and to prove that passenger trains can be built with less investment than formerly but with improved riding qualities, greater speed, and lower operating and maintenance costs.

Coaches are adaptations of bus bodies made by the GMC Truck & Coach Division. Exterior styling and interior trim were designed by those who create GM automobile styles. The 12-cylinder, 1200-hp diesel and the Electro-Motive generators are standard, as are the auxiliary diesel engines, from Detroit Diesel Engine Division, and the auxiliary generators, from Delco Products Division. Air-conditioning units are from the Frigidaire Division.

Besides utilizing one million square feet of ground, just south of Chicago's Soldier Field, the surface of Lake Michigan also will be used to exhibit a number of the most interesting of GM's wares. The World War II submarine *Tautog* will be tied up at a pier, open each day for inspection. It is one of 172 subs powered by GM diesels. The "Terrible T" sank 26 Japanese ships during the war. It is powered by four 16-cylinder engines made by Cleveland Diesel Engine Division of G.M.

Another type of craft for Powerama visitors to see will be the 118-ft. *Laurence C. Turner*, said to be the largest tug on the Great Lakes. Originally a Milwaukee fireboat, it now is owned by the Great Lakes Towing Co. Propulsion machinery consists of a 16-cylinder, GM Model 278A diesel, rated 1740 hp at 750 rpm. The engine drives a 1090-kw generator which supplies power to the propulsion motor through gears at 198 to 248 shaft rpm.

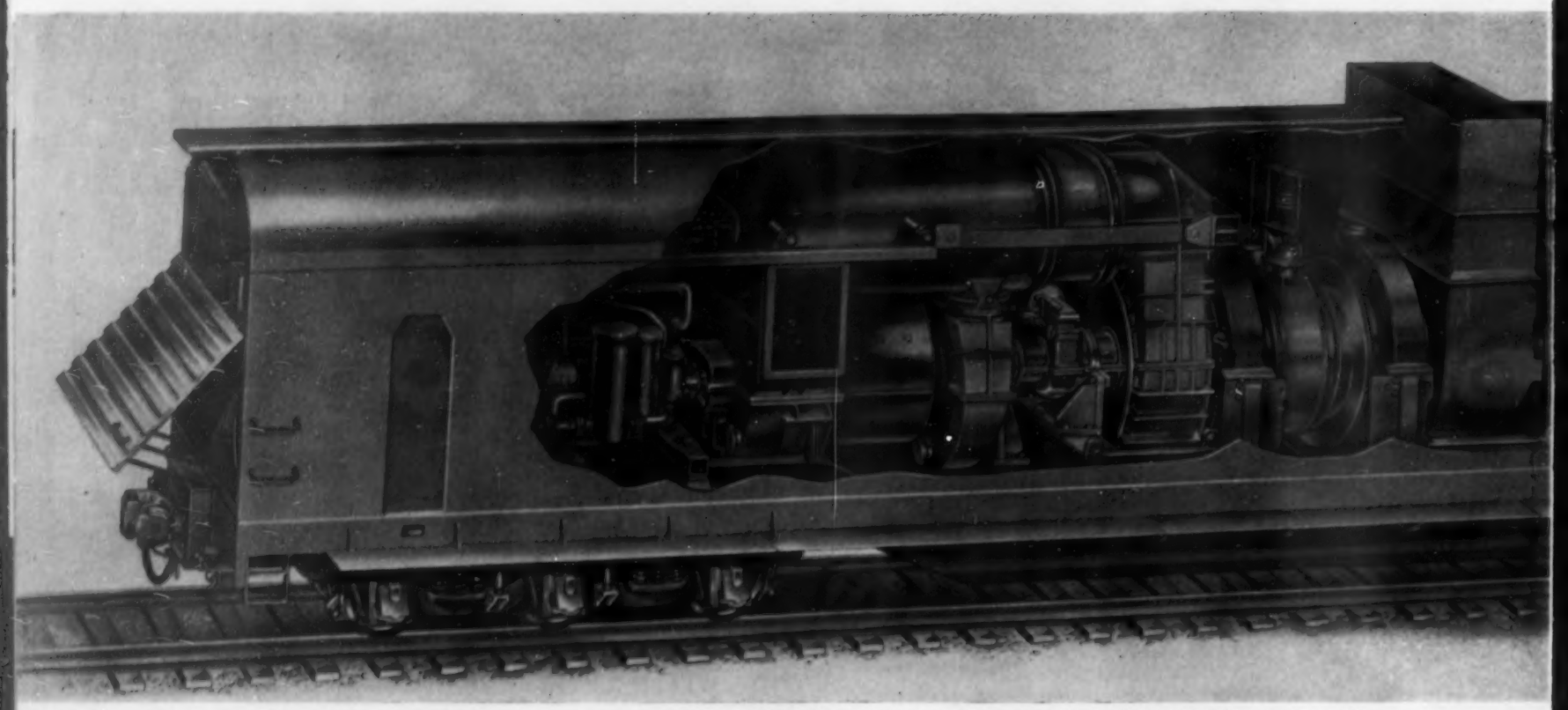
Smaller boats at the Powerama dock will be *Miss Powerama*, a Florida shrimp boat, and *Jimmy D IV*, a 22-ft., 24-knot overnight cruiser. The shrimper was built in St. Augustine, Fla., and was sailed up the Atlantic Coast through the Erie Canal and the Great Lakes. It is powered by a Model 6-110 Detroit Diesel. The *Jimmy* is about as small as any dieselized boat in this country. Its propulsion is provided with a Detroit Diesel Model 4-51, delivering 87 shp. Another yacht—a 37-footer—and a crew boat, used by offshore drilling operators, also will be demonstrated at Chicago.

Dieselized road-building machinery will be displayed along a section of "highway under construction." Shovels, dirt-loaders, earth-movers, graders, ditchers, compactors and pavers will be "stopped" in realistic poses to illustrate the part each plays in constructing both asphalt and concrete roads.

City residents will have an opportunity to see the various ways in which diesels are used by farmers. A single plot of ground on the lake front will be plowed as many times during the 26 days of the show as would normally occur in 338 years of farming. In the shadow of Loop skyscrapers, the ground will be plowed 13 times a day with a wheel tractor powered by a 3-cylinder Detroit Diesel engine, pulling a 6-bottom, 16-in. plow. After each demonstration, the ground will be compacted by a roller and a sheep's-foot tamper. The normal hardness and moisture of a farmer's field will be established before each plowing.

Among the non-diesel displays that are expected to attract crowds will be two guided missiles and a full-size model of the U. S. Navy's vertical take-off fighter plane. The Convair XFY-1 is powered by an Allison T40 turbo-prop engine. Both missiles, the Navy's Regulus and the Air Force's Matador, are powered by Allison J33 turbo-jet engines. In another Allison exhibit, visitors may look through a glass window and watch the burning of fuel and air which generates energy for the jet exhaust in a J35 turbo-jet engine.

In all, the Powerama will have more than 150 exhibits. There will also be free entertainment during each day. The exposition will be open from 10 a.m. until 11 p.m. each day excepting Sundays when the openings will be at noon.



Cutaway view of the mobile power plant powered by a Clark Gas Turbine. Left to right: diesel engine for starting and auxiliary purposes; gas turbine; generator; exciter, fuel pumps; and control room. Outside connections are made to fuel and transmission lines; otherwise plant is self-contained. Opening in roof is for exhaust from turbine. Opening in end of car is for air for lube oil cooler.

CLARK BUILDS MOBILE GAS TURBINE PLANT

By MICHAEL T. PATE

COMPRESSING an entire 5500 kw generating plant and its power within the width and height limits of railway clearances, and then tailoring the entire unit to fit within one specially-designed car, is the feat recently accomplished by Clark Bros. Co., Olean, N. Y., a division of Dresser Industries, Inc. The prime mover for this power unit, designed for emergency service, is a gas turbine which develops 8000 hp at the output shaft. It is a simple combustion gas turbine of the open-cycle, non-regenerative, dual-shaft, series-flow type direct-driving a two-pole synchronous generator. Power output is rated at 80°F. ambient temperature and altitudes up to 1000 ft. above sea level.

Shown recently to representatives of the technical press at the test site within the Clark Bros. plant, the unit is the first built for the U. S. Navy Bureau of Yards and Docks. It is designed to be transported readily to a site of disaster. If a stationary power plant is damaged by catastrophe or enemy action, this unit can be put into service in a minimum of time. Its primary function, of course, will be to furnish power to any shore station of the Navy immobilized by failure of a stationary plant. Although designed as an emergency unit, the plant is of sufficiently rugged design to allow it to be operated continuously no matter what the duration of the emergency may be.

Only one trained operator is required to start and operate the plant. At startup, an auxiliary diesel engine is used to bring the turbine up to sustaining speed. This unit also provides all of the power for the electric auxiliaries. When all requirements for starting are met, such as lube oil pressure, fuel pressure, etc., a ready-to-start lamp comes on, indicating that the operator can press the start button. This initiates a series of automatic operations—ignition on, ignitor air on, and ignitor fuel on. The pilot flame, sensed by the combustion control pilot scanner, opens the main fuel valve. When sustaining speed is reached on the turbine, the starting engine automatically disengages. After turbine warm-up, the main generator speed is adjusted to synchronize with the auxiliary generator which is then shut down. The main circuit breaker is closed and the turbine control switched to automatic. A normal shutdown is accomplished by reducing the turbine power setting gradually to idling and opening the main circuit breaker. The auxiliary diesel is restarted and the electrical load of the auxiliaries is taken over by the diesel-driven auxiliary generator. The main unit can then be stopped by pushing the stop button.

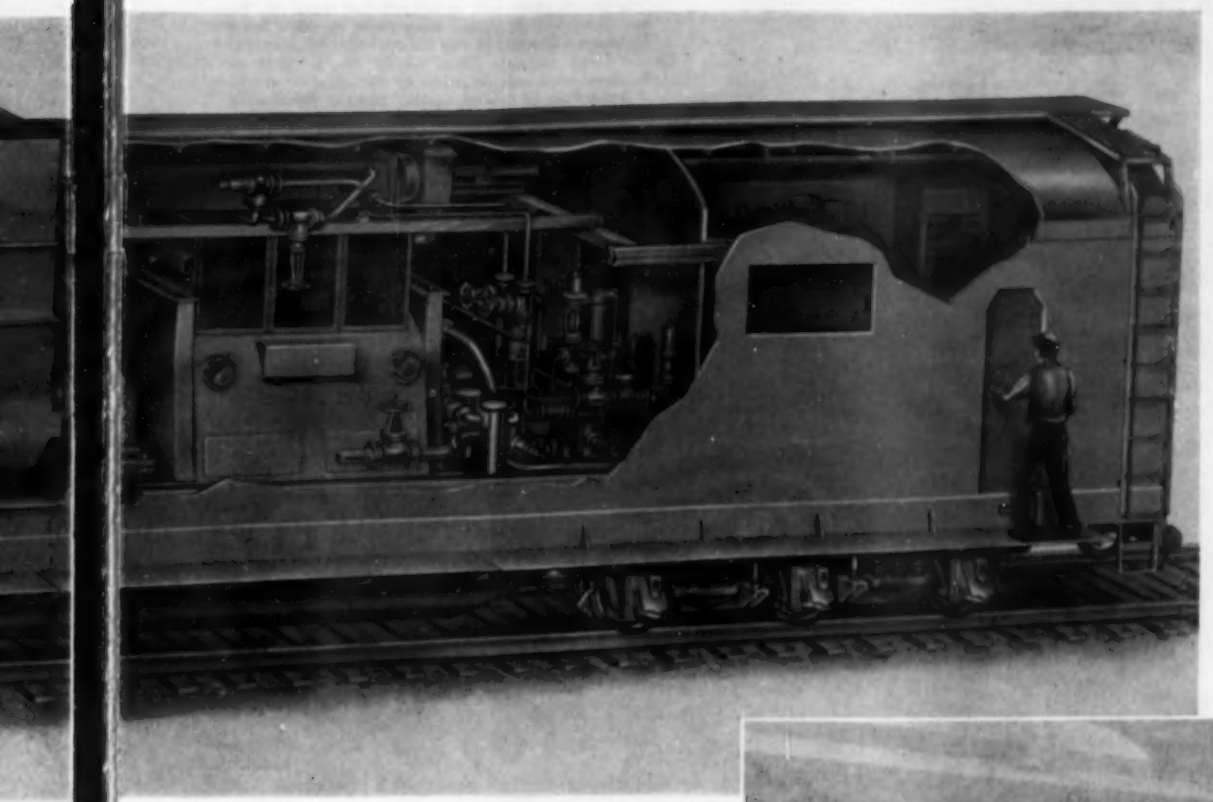
The gas turbine consists of an axial flow compressor and axial flow turbine with two shafts. The first (high pressure) turbine, of two stages, drives the axial flow compressor supplying combustion air. The second turbine, running independently, drives the load generator directly at 3600 rpm. The manufacturer lists the performance of the machine at various load conditions as follows:

Loading	*Output KW*	*Heat Rate*	*Efficiency*
Full load	500	18,000	19
¾ Load	4125	20,600	16.6
½ Load	2750	34,200	13.2

Facilities are provided in the fuel system for operation of the gas turbine with residual fuel oils. In order to minimize the effects of vanadium attack, blade fouling from ash deposit and other faults arising from the combustion of this type of fuel, it will be necessary to limit the turbine inlet temperature to 1150°F. The expected maximum station output when operating at this limiting turbine temperature is 3200 kw.

Combustion air is supplied by a 13-stage axial flow compressor at a pressure ratio of 4.25 and a flow of 100 lb./sec. The compressor is driven through a flexible coupling by the high-pressure turbine at 5000 rpm. The compressor case is split on the horizontal center line to provide ease of assembly and accessibility. The rotor is a two-piece forged drum with circumferential "T" grooves. Blading is designed with low loading factors. Rotor blades are inserted through a single slot which is closed by means of a locking insert. Stator blades are mounted in quarter circular rings which are easily accessible and may be rolled out of the casing for inspection. The rotor need not be removed.

Combustion of the fuel is accomplished in a single, highly stable contra-flow combustion chamber. The single combustion chamber used gives the simplest possible arrangement without the matching diffi-

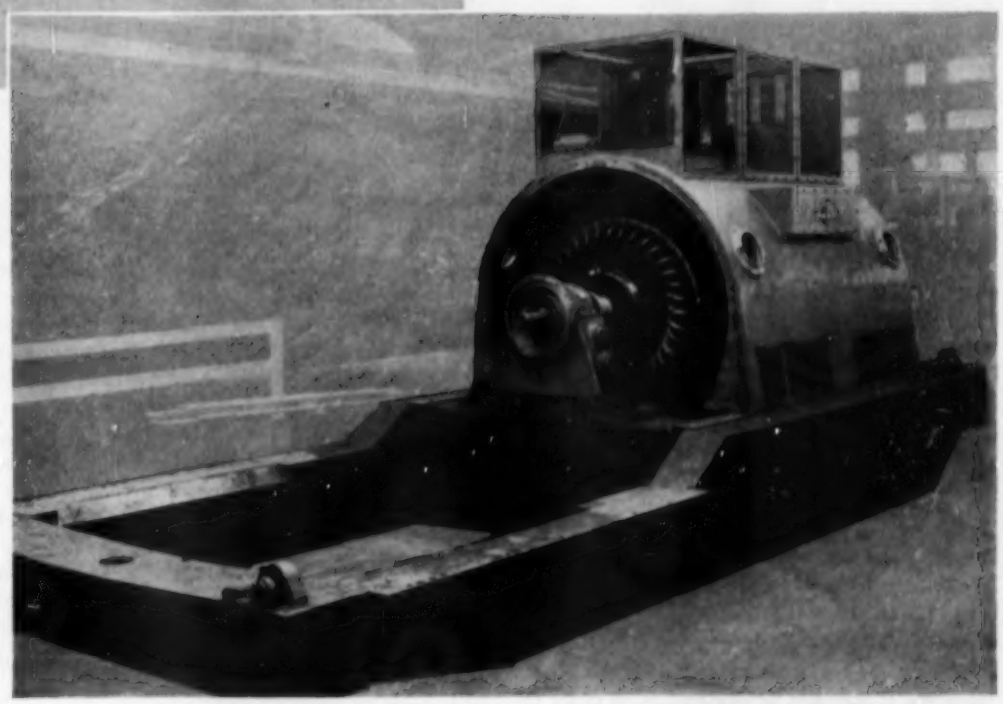


culties of multiple chambers. The chamber consists of two shells forming an inner combustion area and an outer annulus. Primary air flows through the outer annulus to the end of the chamber and enters the inner area where fuel is injected and burned. The secondary air passes from the outer annulus through openings into the inner chamber where it mixes with the products of combustion. The air flowing through the outer annulus also cools the inner walls to a temperature consistent with long life. Combustion chamber liner changes are not required during the life of the turbine. Three fuel atomizers are supplied. To facilitate maintenance, the nozzle installations are so designed that any area may be shut off and removed for cleaning or replacement.

The turbine consists of two separate units—the high-pressure turbine, which is a two-stage unit operating at 5000 rpm, driving the axial compressor; and the low-pressure turbine, which is a two-stage unit operating at 3600 rpm, driving the load generator. The rotating blades are forged and shrouded, reducing interstage losses. The stator blades are precision cast and attached to carrier rings with controlled clearances permitting thermal expansion without strain or distortion. Tip and turbine disc labyrinth seals minimize leakage. The separate turbine design allows mounting of the two sub-assemblies on two separate bases. A flexible duct connecting the high-pressure turbine is easily removed. This area then provides access to both turbines, either of which may be completely inspected by removal of wheels and nozzle rings.

The turbine is designed for normal operation at an inlet temperature of 1350°F. Temperatures in excess of 1350°F. may be maintained for varying percentages of operating time. All radial bearings are babbitted, bronze-backed, precision bearings, while thrust bearings are the conventional Kingsbury type. The unit is mounted on the car on two independent sub-bases. One supports the compressor and first turbine, the other the second turbine and generator-exciter combination. Each sub-base is carried at three points selected to assure minimum deflections. This three-point suspension is designed to provide correct degree of freedom at each joint and thereby permit normal deflection of the basic car structure without causing any shaft misalignment. Relative movement due to car deflections between the respective sub-bases will be readily accommodated by the flexible duct installed between turbines. The turbines thermo-elastic support system holds the hot parts inside a cold ring. The hot components may expand and contract concentrically without influencing the alignment.

The air cooling system assures rapid trouble-free starting and stopping, according to Clark Bros. Cooling maintains all supports at a minimum temperature, thereby eliminating thermal stress and alignment problems. Water is not required. Air is introduced through openings on the inner diameter of the first stage stator ring. The cool flow of

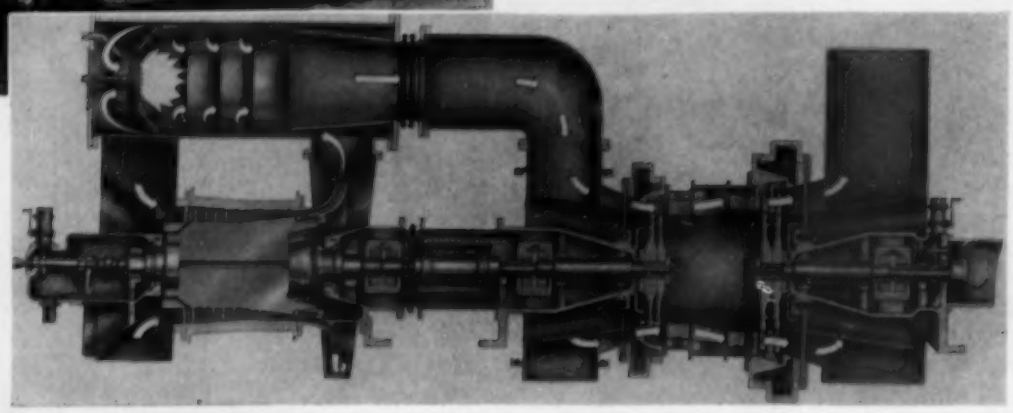


The Electric Machinery 2-pole generator was specifically designed for mobile use. The rugged base is secured to the car frame. The generator and exciter are self-cooled by centrifugal-type blowers.

Present to witness a demonstration of the new Clark Turbomobile plant were: H. N. Mallon, president, Dresser Industries, Inc.; Capt. J. C. Tily, USN, of Third Naval District Public Works Office; John H. Stambaugh, White House assistant; an unidentified gentleman; Cdr. F. B. Kelly, USN, District Public Works office; J. B. O'Connor, executive vice president, Dresser Industries; and J. N. MacKendrick, president of Clark Bros., one of the Dresser Industries.

The power plant car, as delivered to the U. S. Navy, was designed to assure maximum support for the turbine-generator. It can be operated on any standard gauge railway. Filter "sheds" on each side serve to filter the dual air inlets to the axial compressor. They can be folded against the car for transit.

This simplified cross-section shows the flow of air and gas through the Clark Gas Turbine. Air enters compressor at lower left which discharges into the combustion chamber, upper left, where it is mixed with either liquid or gaseous fuel and burned. Hot gases enter high-pressure turbine, center, turning this turbine and compressor connected to it. Hot gases then enter the low-pressure turbine, right, which is connected to the load.



air over the blade roots and the supporting disc gives a low mean temperature.

The 5500 kw, 3600/3000 rpm, 60/50 cycle, 12,500 volts, 80% power factor, 3-phase, 40°C ambient temperature synchronous generator is of the two pedestal bearing construction and is driven directly from the gas turbine output shaft through a flexible coupling. The oil lubricated sleeve bearings are fitted with oil flow indicators, bearing temperature relays and proper fittings to take lubrication. Temperature detectors are imbedded between the stator coils and connected to a panel mounted temperature indicator. The generator is totally enclosed and of the self ventilated type. Two high efficiency carefully designed aerodynamic blowers, one at each end of the rotor body, force air through the frame ventilating system.

The generator switchgear and motor control apparatus is of the dead-front, metal enclosed type and consisting of the main power circuit breaker, various smaller breakers, bus bars, potential and current instrument transformers and various instrumentation and relaying as required.

An auxiliary generator is provided which is driven by a 159 bhp, two-stroke 1800 rpm, six-cylinder diesel engine. The same engine, driving from the opposite end of the shaft through a hydraulic torque converter, serves as the starting engine for the main unit. The auxiliary generator is rated at 50 kva at .8 power factor, 480 volts, ac, three-phase, 60 cycles. It may also be operated at 50 cycles by reducing speed to 1500 rpm where voltage is reduced to 400 volts. This generator supplies all electrical power necessary for start-up, shut-down, and cooling fan operations. In addition, it supplies all station lighting and power requirements when the main generator is not producing power.

The lubricating system is a common system for all equipment. Oil for the bearings and starting speed increaser gear is contained in a main 500-gal. tank. Three pumps are included: the main pump, which is driven from a gear on the compressor shaft; the auxiliary ac electric-driven pump for automatic supply when the main pump is not delivering sufficient pressure; and the auxiliary dc electric-driven pump which operates on total electric power failure. Each pump is protected against back flow from any other pump by a check valve. Full filtering is accomplished with duplex type filters which may be cleaned while in operation. Micro-filtration is through a bleed arrangement 10 micron filter. Return oil from all bearings, generator, exciter, turbines, compressor and gear—is through gravity flow scavenge lines back to the main tank.

The fuel system is designed for operation with No. 2 diesel fuel oil. Provisions are made to burn residual fuels after making minor adjustments to the pressure regulators and valving. The main fuel day tank has a capacity of 500 gal. Fuel is pumped from the heated tank through strainers to the fuel nozzles in the combustion chamber where it is atomized and burned. Fuel flow is regulated by a pneumatically operated valve. The valve is operated in accordance to the load demands of the governor. The upstream fuel pressure is controlled by a diaphragm type regulator which returns excess fuel to the tank. The auxiliary diesel fuel system is supplied by a separate 500-gal. tank for startup and shutdown whenever residual fuel is to be used in the main system. The complete system may be purged with diesel fuel to prevent congealing of the residual fuel as it cools.

The governor control system is a pneumatic system which regulates the alternator speed or frequency by regulation of fuel flow rate. The primary control is the speed governing system. The acceleration of the axial flow compressor is regulated by means of a secondary over-riding control during startup. This secondary control limits the turbine acceleration by limiting the turbine temperature. The turbine temperature, while operating under overload condition, is limited by a temperature limiting control. The temperature limiter may be set at any desired maximum temperature which will override the signal sent to the temperature recording controller by the pressure controller. The pilot valve automatically substitutes a manually preset signal corresponding to an idling speed for the signal from the automatic control systems to the valve positioners in the event of speed transmitter failure. A pressure alarm also transmits a signal to the annunciator giving warning of such an event. The flow transmitter transmits a signal to a flow recorder. The control may be switched from automatic to manual with the automatic-to-manual unit.

Clark design utilizes a 13-stage axial compressor. By using a split shaft design, the compressor can operate at its optimum speed and efficiency, a higher rotative speed than the 3600 rph used for the load turbine. Inlet air comes from filter "sheds" on the sides of the car.

This Caterpillar D318 Diesel—powering a crane—works through a Twin Disc Model CF Torque Converter which provides faster work cycles, protects both engine and driven equipment. Behind the Model CF are a Twin Disc Reverse Gear and two Twin Disc Heavy-Duty Friction Clutches.

Why the trend is to Torque Converters

Planning to order a new power unit?

Today, many equipment owners are planning on getting *more* work output . . . and *longer* equipment life: they're ordering their new power units *complete* with Twin Disc Torque Converter Drive. And they're having Torque Converter Drive installed on equipment already working in the field.

Why? Briefly, here are six *proven* reasons why: 1 Through the Twin Disc Three-Stage design, their engines' output torque is *multiplied up to six times* . . . the highest torque multiplication available. Consequently, they're *eliminating* harmful, costly engine lugging and stalling. 2 With Torque Converter Drive, their engines are working up in the maximum efficiency range *all* the time, delivering *constant* high-horsepower output. 3 Power is *automatically* matched to the load demand, with gear-shifting minimized or eliminated. 4 Heavy load pick-up is *smooth, even, without* clutch-slippage. 5 Overloads, shock loads, vibrations and torsional variations are cushioned *out,* through *fluid* connection . . . which means *longer* life, *less* maintenance on engines, transmissions, clutches, drive line components *and* driven equipment. 6 Torque Converter Drive provides an *infinite* variety of ratios to work with, permitting *smooth, accurate control* of the load and delicate "inching" or "holding" under power.

So if you're thinking about a new power unit . . . or thinking about present equipment needing more power, more performance . . . *be sure to get the facts on Torque Converter Drive.* Ask your engine dealer. Or write *today* to Twin Disc Clutch Company, Hydraulic Division, Rockford, Ill., for Bulletin 135-D.

By providing the most COMPLETE line of Industrial-Type Torque Converters available, Twin Disc can accommodate any type gas or diesel engine up to 650 hp—with practically any hook-up. Three series, or sizes, of Three-Stage Torque Converters are provided, with 7 capacities in each size through internal blading variations. A total of 20 different input, output combinations are available, making Twin Disc Torque Converters easily adaptable to any type installation.

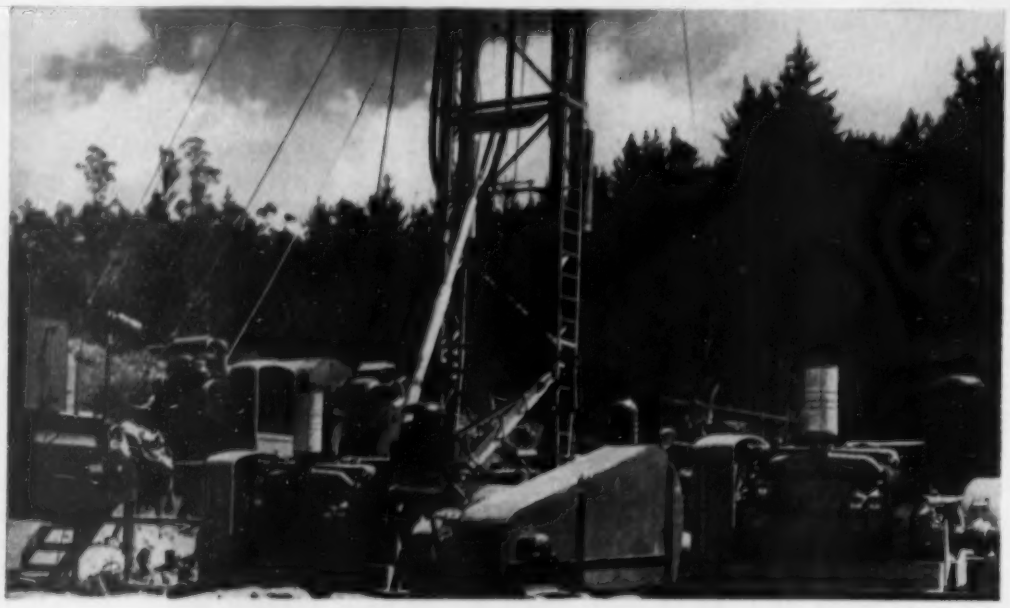
TWIN DISC

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

Drilling For Steam

American drilling equipment powered by General Motors diesel engines, is helping the government of New Zealand to study the characteristics of natural steam available in that dominion, with the view of possibly utilizing it to generate electric power. There's lots of steam available. A volcanic area, which is as much as 20 miles wide, extends 100 miles from the approximate center of North Island to the sea. A 7500-foot volcano is presently in eruption, and throughout the area there are many natural steam outlets and innumerable hot water lakes and streams. Some of the outlets actually produce superheated steam, although most of them flow a combination of steam and water. It's a prospect to tempt any power expert.



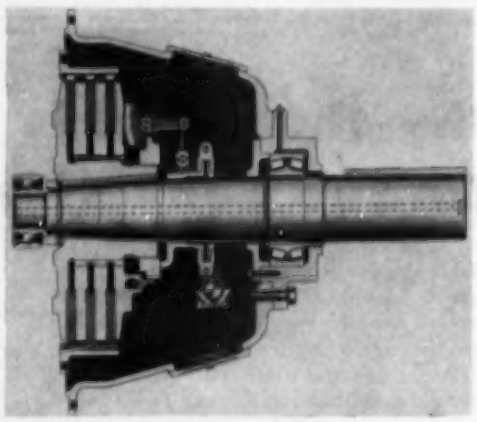
A small fraction of the steam and hot water is utilized by the native Mauri in their mountain villages, affording them the luxury of steam cooking and heating, together with plenty of hot water for laundering and bathing. But much of it serves no purpose except as an attraction for occasional tourists. Before it invests in a generating plant to harness the steam, the Ministry of Works wants to make sure the project is practical and economically feasible. That's why the geothermal studies were authorized and why the dieselized drilling equipment was put to work.

Initially some shallow wells were drilled, but to reach greater depths the government purchased two Ideal Type T-12 Rigs, manufactured by The National Supply Co. The T-12 is a compact, portable rig, rated at 120 input horsepower. In the New Zealand operations, the T-12, complete with draw works, GM diesels, mud pump, and a 96-foot folding mast, is carried on a semi-trailer, and set up quickly at the drilling site. One of the deepest wells went to 3200 feet, with 8⅝-inch casing set to bottom as a flow string.

New Twin Disc Friction Power Take-Off

With industrial engines developing higher horsepower, and higher rpm today, there is a growing need for more rugged power-take-offs to accommodate the extra stresses and strains involved in this increased power and speed. To meet this need, the Twin Disc Clutch Company has developed an all-new heavy-duty friction power take-off, designed and engineered especially to meet the extra requirements of diesels in the 350 to 375 hp class, operating in the 1800 rpm range. Extremely compact for its capacity, the new Twin Disc power take-off accommodates an SAE No. 0 flywheel. With triple drive-plate construction, it assures ample friction surfaces to withstand excessive heat. And with the solid driving-plate design, the new PTO can effectively handle the stress of higher rpm.

The pilot bearing of the new power take-off is composed of a single row of balls, operating in bearing races of double-row width . . . providing improved accommodation of minor misalignment inherent with installations of this nature. Pilot bearings of this type provide additional space for lubricant, which is effectively retained by the double grease shield construction. Although this construction is usually referred to as "sealed for life," the clutch shaft is drilled to provide for relubrication of the pilot bearing in the conventional not "sealed for life" manner.



Cutaway drawing of the new Twin Disc SP-318 heavy-duty friction power take-off.

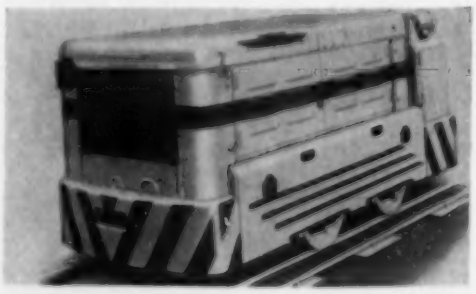
Another feature of the new Twin Disc power take-off is the use of spherical bearings. With its inherent ability to permit angularity, the spherical bearing is more resistant to overload, or destructive forces from heavy slide loads. Thus it is, in effect, self-aligning. Other features include a husky, oversize shaft and counter-balanced engaging linkage.

This new Twin Disc SP-318 friction power take-off is the forerunner of a complete line of power take-offs; but at present, only the SP-314—a smaller model of the same new design—for diesels in the 225 hp range operating at 2200 rpm, is available.

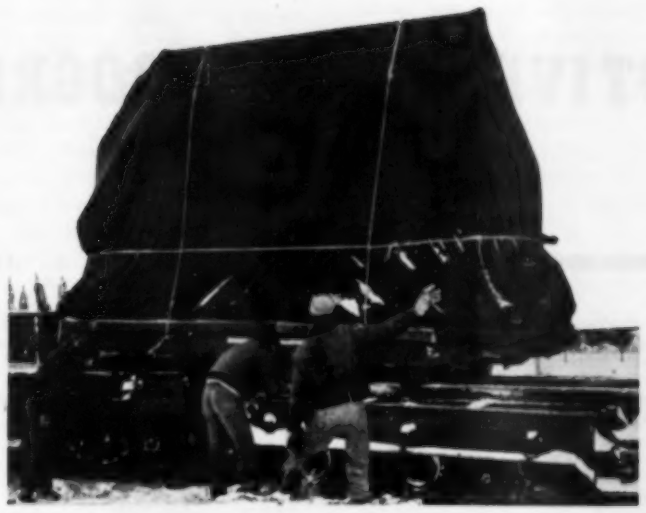
Equipment manufacturers and users desiring more complete information on the new Twin Disc power take-off are invited to write the Twin Disc Clutch Company, Racine, Wisconsin. (ITS NEW)

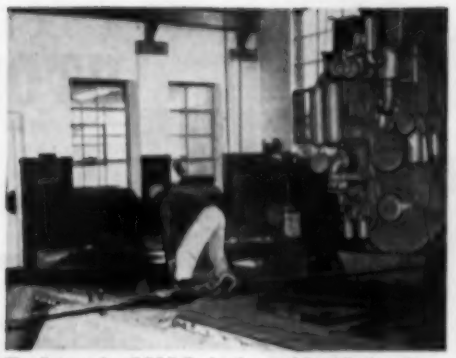
Mining Locomotive Approved

The new Plymouth Locomotive Model FMD-22, powered by a Hercules 4 cylinder diesel engine model DOOD, has received approval under Schedule 22 from the United States Bureau of Mines. The Hercules diesel model DOOD, has 4¼-in. bore and a 4½-in. stroke, 255 cubic in. piston displacement and is rated at 48 hp at 2200 rpm for this particular application. Its clean burning characteristics and dependable operation are two of the many factors entering into the selection of this engine to power the Plymouth FMD-22 Locomotive for underground mine use.



Schedule 22 as established by the Bureau, covers the safe operation of dieselized equipment in underground coal mining. Very strict requirements are set forth under Schedule 22 to insure safe operating conditions in relation to temperatures, exhaust gases and explosive dangers. To illustrate the high standards which the Bureau established, it was 6½ years before any American manufacturer developed a design which could meet the rigid requirements of Schedule 22. This first design to be approved was also powered by a Hercules Diesel engine of a different size. (ITS NEW)





The Enterprise DGSQ Turbocharged Dual Fuel engine is moved into place as a unit. With 16" bore and 20" stroke, it is rated 1422 HP at a speed of only 360 RPM.

Fourth Enterprise Engine arrives at Belleville under protective wraps of all-weather tarpaulin. This new addition adds 1000 KW to plant's capacity.

Bright Power Picture at Belleville: Better Schools and Streets, with Lower Taxes!

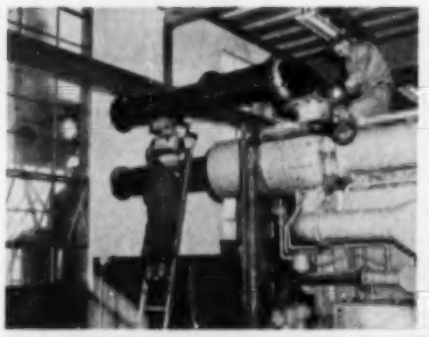
"We recently installed the fourth Enterprise Engine in our 100% Enterprise Dual Fuel plant. Our excellent experience with this equipment over the past eight years has proved it to be our best buy in engines. Operating and maintenance costs have been consistently low, greatly reducing power costs and helping make Belleville one of the most thriving and progressive cities in the middle west. We have better schools and streets, lower taxes, above-average recreational facilities, and many other advantages enjoyed by only very few cities of similar size."

Earl E. Whitney, City Manager
Belleville, Kansas

City managers, municipal engineers, superintendents — all those concerned with the growth, the future, the prosperity of their community, can look to Enterprise Engines confident they will get this same kind of dependable and economical power-generating performance.

Enterprise Engines — Diesel, Dual Fuel, Spark Ignited Gas — serve every municipal need

The most modern engineering advances are reflected in every Enterprise model, from 73 to 6933 HP, for stationary or portable electric service, flood or water pumping systems, sewage plant power. See the Enterprise sales engineer in your area, or contact us direct for information or help with your plans.



Installation nears completion as exhaust stack and muffler are installed. This "all Enterprise" plant, with its 2500 KW capacity, now has ample dependable reserve power for any emergency, future growth.

New member of the all Enterprise power team is cut in on the line. Low maintenance cost, excellent service record, and over-all economy of the Enterprise engines already in use were the big factors in its selection.

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AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

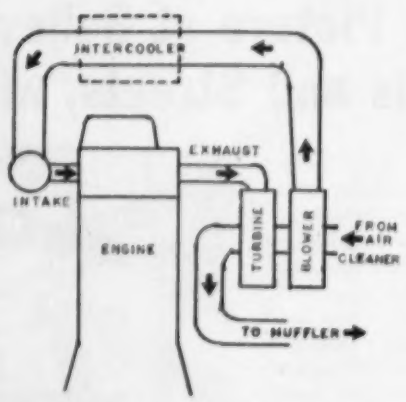
Exhaust Driven Turbochargers For Automotive Diesels

AUTOMOTIVE diesels are entering a new era of increased specific power output by the rapidly-spreading adoption of the exhaust-driven turbo-supercharger, or turbocharger as it is popularly termed. This follows the spectacular success of this device on large stationary and marine engines and of course on railway locomotive diesels. Much of this development has been made possible by the advances made during and since World War II in high-strength, heat-resisting alloys used in both steam and gas turbines for naval and aeronautical purposes.

Much of the disadvantages which diesel engines have suffered in comparison with gasoline engines in automotive application, by reason of their greater size and weight for given power output, bids fair to disappear with the general adoption of exhaust-driven superchargers. Engines so equipped naturally will cost more than naturally-aspirated engines of equivalent displacement; but may well compete with those of equal power. They will certainly be lighter and more compact and it seems fairly certain that they will be more economical. Indications are that their life expectancy and reliability will be fully equal to nonsupercharged diesels. Well-informed authorities confidently predict that, before many years, there will be no naturally-aspirated diesels in the automotive field.

Net gains in specific horsepower under present conditions are of the order of 20%; but further development is expected to raise this to 40% in the future. Before this can be accomplished without sacrifice of engine life, reliability and maintenance economy, however, much needs to be done in research and experimentation.

Supercharging, by whatever method, is simply a means of increasing the volume of air entering the combustion chamber per cycle beyond that which can be sucked in at atmospheric pressure. It is a means of making a cylinder of given size do the work of a larger one. It is attractive in that it permits the required horsepower output to be secured with less piston displacement than would be required with natural aspiration and thereby reduces



the size and weight of the engine. However, this is not a clear gain, since an increase in horsepower per cubic inch at a given speed can be obtained only by dint of higher brake mean effective pressure and correspondingly higher temperature fo combustion which, in turn, calls for somewhat heavier construction. Moreover, the mechanical requirements of the engine for a given power and torque output remain the same, regardless of cylinder size.

Where supercharging is used to increase the output of an engine beyond what is practicable with natural aspiration, the duty on all of its mechanical and structural parts is increased, so that unless it was originally more robust than strictly necessary, it may have to be heavied up.

Mechanically-driven superchargers derive their driving energy from the engine crankshaft, so that approximately half of the increased indicated horsepower is used up in driving the blower, leaving the net gain considerably below what might be expected. At the same time the engine is subjected to the increased mechanical and heat stressing imposed by the full gain in indicated horsepower. Exhaust-driven superchargers, on the other hand, utilize the waste energy of the exhaust to spin the blower. Although the gain in indicated horsepower may be less than with the mechanically-driven affair, a greater percentage of the gain is usable at the flywheel. Of course there are losses, including a surprisingly small reaction on the pistons due to increased exhaust back-pressure, somewhat higher heat rejection to the coolant and mechanical friction resulting from the higher compression and expansion pressures; but these aggregate decidedly less than the losses entailed in mechanical drive.

Another characteristic of the turbocharging method is that whereas the mechanically-driven blower delivers approximately a constant percentage of supercharge; the exhaust-driven blower varies its degree of supercharge according to the load on the engine. Under light loads, the exhaust pressure being low, the turbocharger runs relatively slower and so delivers less supercharge; while under heavy load, the exhaust pressure is higher and so the turbocharger delivers a greater degree of supercharge.

Not all of the benefit of turbocharging is attributable to the use of exhaust power. The centrifugal blower, invariably associated with the exhaust-driven turbine, offers advantages in respect to size and weight, simplicity, ease and cost of maintenance, as well as improved efficiency as compared with the positive displacement or Rootes-type blower. It would, of course, be possible to drive a Rootes blower by exhaust turbine, just as centrifugal blowers are now driven mechanically.

Greater difficulty has attended the development of exhaust-driven superchargers for automotive use than in their prior application to alrger, slower engines. Part of this is due to the scale effect, part to the necessity for light weight, the utmost compactness and desirable simplicity. By far the greatest problem has been to provide the greater flexibility in terms of variable loads and speeds which is a prime necessity.

Difficulty has been experienced in sustaining a relatively flat torque curve and a similarly flat economy curve throughout the useful range of speeds and loads required in automotive applications. It has been found that losses in the supercharging system are greater between the exhaust manifold and the turbine than between the blower and the intake manifold. This has led most automotive diesel builders to place the turbocharger directly adjacent

to the middle of the exhaust manifold. The reason for this is that less of the energy of the exhaust is lost through gas friction and heat loss because of the shorter column.

Intercoolers, for the purpose of condensing the air charge, which in big engines are said to have resulted in gains of as much as 15%, have so far not proven sufficiently advantageous in the small, high-speed types to warrant their use. To reap the benefit of the increase of approximately 20% in the volume of air delivered to the cylinders, it is of course necessary to increase correspondingly, the volume of fuel delivered by the nozzles. This involves larger total orifice area or else resort to much higher injection pressures. The fuel delivery rate will range in the proportion of 8-to-1 between full power and starting or idling. Larger spray holes are compatible with desirable spray pattern only when increased fuel delivery takes place. At light load, however, such larger orifices result in a deterioration of the spray, which, with the lower compression pressures present at such times with some turbochargers, may result in objectionable smoke.

In large diesels, this difficulty is met by means of pilot injection or multiple nozzles. This is hardly practicable in automotive types; but it has been found that by retaining a high compression ratio and utilizing air swirl or extremely high injection pressures, nozzle orifices large enough to secure the desired maximum power can be employed without objectionable smoke at light loads. Variable blading of the turbine, the blower, or both, holds possibilities for improvement in the flexibility of the turbocharger to provide abundant air at both part-load and full-power operation.

Although the turbocharger delivers air in volume and pressure proportional to the load on the engine, the more efficient the basic cycle of the engine, the lower the exhaust pressure under any condition will be and hence the less energy will be available to spin the turbine. In the effort to increase the turbocharger output, some engine builders have timed their exhaust valves to open earlier in the expansion stroke. This would seem to defeat its ultimate purpose, however, for an earlier opening of the exhaust valves means a shorter expansion stroke or less expansion ratio and thereby a decrease in thermal efficiency.

It is general practice to reduce the compression ratio of supercharged engines in order to gain combustion chamber volume, and to limit maximum compression pressures, equal to those maintained in corresponding naturally-aspirated engines. This does not seriously affect starting where positive-displacement blowers, mechanically-driven, are used; but exhaust-driven blowers do not function until after the engine starts. Hence the compression heat is insufficient in most cases for unaided starts. This necessitates extra complication, such as dual-fuel systems, ether injection, pre-heaters or glow-plugs.

However, it has been found by at least one automotive diesel builder that turbochargers can be successfully applied without reduction in compression ratio. The increase in pressure due to the supercharger is not as great as some have suspected, being usually in the order of 50 lbs. per sq. in. The higher maximum compression pressures resulting do not appear to be deleterious up to present prevailing brake mean effective pressures, while the maintenance of the same compression ratio makes starting the turbocharged engine fully equal to that of the naturally-aspirated type. As higher mean effective pressures are attained, reduction of compression ratio will no doubt be mandatory, for, with excessive compression pressures, peak pressures and corresponding temperatures may well exceed safe limits; but for the present, in automotive practice, this point has not been reached.

Perhaps the most difficult problem in adapting the turbocharger to automotive diesels is that of broadening the range of speeds at which it is efficient and economical. In the search for maximum peak power it is necessary to carry the torque peak to higher speeds, which favors low specific fuel consumption at the higher speeds, but at the sacrifice of economy at moderate speeds. While this is true of all types of internal combustion engines, the effects are exaggerated in turbocharged diesels.

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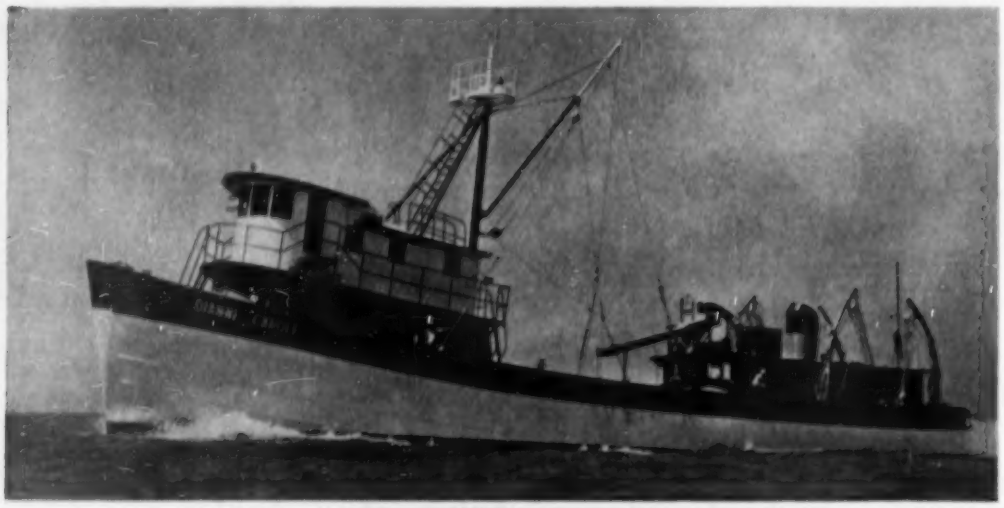
Complete dieselization has long been one of the major objectives of the Missouri Pacific's progressive program of improvement and expansion. Its accomplishment provides the power needed to assure more dependable transportation for travelers and shippers throughout the West-Southwest. With delivery of the latest locomotives, Missouri Pacific's dieselized fleet rose to 873 units placed in service since 1948 at a cost of over $100 million.

Waiting to be hauled away to the scrap yard at Dupo, Ill., these Missouri Pacific Lines steam locomotives stand at Bush, Ill., while on an adjacent track is one of six diesel road switchers (brand new, incidentally) which have supplanted steam power on the last remaining segment of Missouri Pacific Lines to use steam power. No. 4350 is a 1750-hp Electro-Motive diesel.

Missouri Pacific Lines purchased its first diesel locomotive in 1937, both of them being yard switchers. In 1940, with delivery of the Missouri River Eagle streamlined train equipment, the railroad received its first road passenger diesel. The number of diesel locomotives of Missouri Pacific ownership increased gradually until the war years when there were no additions to the diesel fleet. Then, in 1947, when civilian production returned to normal, Missouri Pacific embarked upon a definite program of dieselization. That program has been followed each year and the diesel fleet has increased steadily until now it supplants steam entirely. On the order delivered the early part of this year, 26 were Alco road switchers. The other 40 were Electro-Motive Division of GM units. All were 1750 road switchers.

Menhaden Fishing Vessel

Added to the menhaden fishing fleet at Empire, La., recently was the 120-ft. *Dianne And Carole*, put into service by Capt. John Santos Carinhas, Patterson, La., and Capt. J. Dewey Mills, Moorehead City, N. C., powered by two General Motors 6-110 tandem-twin diesel engines, the craft was built at the Patterson Boat Works. She has a beam of 22 ft. and a draft of six ft. According to the skipper, Captain Willis, the desirable shallow draft achieved is due mainly to the low weight-to-horsepower ratio of the diesels and the fact that they are suitable for use with comparatively small, fast-turning wheels. Turning 54-in.x50-in. 3-blade Columbian screws through 4-to-1 reduction, the engines move the craft at 12½ knots. The twins weigh 11,000 lbs. per unit and each develops 400 continuous shaf. horsepower at 1600 rpm.



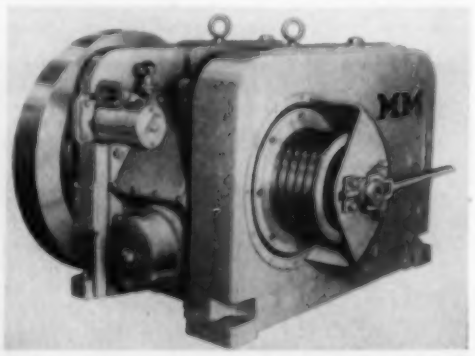
The craft is of steel construction and is modern in every respect. A 10-in. centrifugal pump, driven by a General Motors 6-71 diesel, transfers the catch from the net to a fish hold of 200 tons capacity. Under ordinary fishing conditions, the craft returns to shore at night but sleeping quarters and galley facilities for a crew of 27 are provided. Bilge pumps are operated from front power take-offs on the engines. In addition to the *Dianne And Carole*, Captain Carinhas operates 10 other menhaden and shrimping boats on the Gulf—all with GM diesels. The engines on the *Dianne And Carole* were furnished by the Kennedy Marine Engine Co., Biloxi.

Engine Designed to Run Year Without Service

A radically new engine designed to run continuously for a year without service is announced by Minneapolis-Moline Company, manufacturers of farm machinery and industrial power units. The 20 brake-horsepower, 2-cylinder engine is designated MM Timeline 168. MM engineers have designed a totally new radical cooling system to replace the conventional radiator. Also eliminated are water pump, pulleys, fan, fan belt, and radiator hoses. Water is circulated through a cast-aluminum cooling unit built into the flywheel.

During 1954 and 1955, a number of these long-running MM Timeline power units have been operating continuously without service of any kind for 24 hours a day, in oil field pumping installations according to the manufacturer.

The MM Timeline 168, now in production, is rated at 20 hp at 1200 rpm. Bore is 4⅛-in. and stroke is 5-in. with piston displacement of 168 cubic inches. Future models are planned for 15 hp, with 4¼-in. bore, 5-in. stroke, and 141 cu. in. displacement; and 26 hp with 5⅛-in. bore, 5-in. stroke, and 222 cu. in. displacement. Weight is 2150 pounds. Lubricating oil reservoir capacity is 20 gallons. The cooling system has a capacity of 12 gallons. Channels in the coolant reservoir increase circulation to maintain uniform engine temperature throughout.



Power take-off housing, clutch shaft and bearings are unnecessary on the new Timeline power unit, since the v-belt pulley flange is mounted direct to the drive ring on the power take-off end of the crankshaft. The crankshaft is supported on four large tapered roller bearings.

Removing cylinder-head nuts permits quick removal of both cylinder heads and blocks for service work, as in all models of Minneapolis-Moline engines. A large removable crankcase cover allows inspection of rod bearings and crankshaft journals. The large MM flywheel, greatly reduces speed variations encountered in pumping operations. As a safety precaution in case of oil pressure dropping below a safe limit, or of excessive temperature of the coolant, automatic grounding of the magneto shuts off the engine. (ITS NEW)

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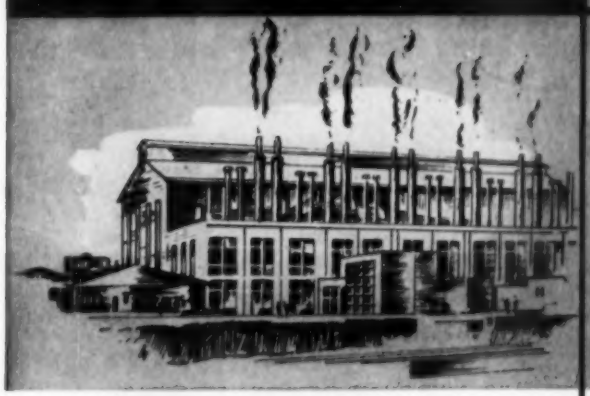
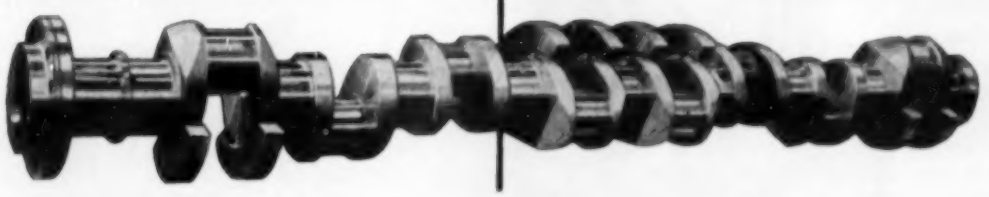
ERIE FORGE Diesel Crankshafts!





Here's the "Giant in the Diesel" . . . transmitting power that drives the modern railroad engines, pushes huge ships speedily and surely through the waves, or runs the power plants of business and industry. Erie Forge crankshafts are produced — from pouring of ingot to finished product — in our own plant. Every step is under the complete control of experienced craftsmen . . . one control, one responsibility. At Erie Forge you get the full benefit of our know-how and experience in the production of highest quality crankshafts — of exactly the right material to meet the most rigid requirements. Consult with Erie Forge on your next shafting requirements.

ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA

Gulf Coast Diesel Notes

By Michael T. Pate

U. S. MARINE CORPS ordered 155 Stewart & Stevenson Model 24700 generator sets, each individually trailer mounted. The sets generate 20 kw, 400 cycle, 3-phase current, and are powered by GM Model 2055 2-cylinder diesels.

JOHN BUZZERO, Galveston, is powering his shrimp boat with a Murphy Model M-135 diesel, driving through a 3:1 Snow-Nabstedt reduction gear. The diesel is rated at 135 continuous horsepower. The unit was bought through Houston Engine & Pump Company.

E. W. AND A. P. DuPONT, boat builders of Morgan City, La., are equipping their new twin-screw 65-foot crew boat with a pair of 6-cylinder, supercharged Hercules marine diesels, secured from Hercules Motors, Houston.

GULF Shipbuilding Corp., Port Arthur, Texas, is equipping a converted buoy tender with two Caterpillar Model D342 diesels, each driving a 100 kw dc Reliance generator. They also secured from Mustang Tractor & Equipment Company, Houston, a Caterpillar Model D311 to drive a Worthington pump to be set in the same tender.

PRODUCERS Chemical Service, Borger, Texas, has bought from Stewart & Stevenson Services, Inc., a Model 6030C open-type General Motors diesel for service on a cementing unit. The diesel is rated at 130 hp continuous rating.

HOUSTON Contracting Co. has bought from Big 3 Welding Equipment Co. 12 ac Lincoln welding machines, rated at 250 amps. The generators are each driven by a 4-cylinder Hercules diesel.

ANACO WELL Servicing Co., Odessa, Texas, has bought from Stewart & Stevenson of Houston two Model 12107 twin-six General Motors diesels, rated at 260 hp each. The two diesels, torque-converter-equipped, are being compounded to an Emsco DA500 mud pump through chain drive. The company also bought a Model 8107 twin-four General Motors torque-converter-equipped, 175-hp diesel unitized with a Gardner-Denver PA8 power pump; and one Stewart & Stevenson Model 2GD22 generating set rated at 20 kw and powered by a General Motors 2-cylinder diesel.

INDEPENDENT Air Controls, Inc., Fort Worth, has bought from Waukesha Sales & Service, Inc., Houston, a Model 180DLCU Waukesha diesel, delivering 33 hp at 2000 rpm.

U. S. AIR FORCE bought 85 Stewart & Stevenson Model 23300 Air Force Type MBZ 25 kw, 3-phase, 60-cycle generator units, trailer mounted. The generators are driven by Model 2055 General Motors diesels. The units are designed for operating in temperatures from minus 65°F to plus 131°F.

CARMELLO CAMPANELLO, Galveston, bought from Houston Engine & Pump Co. a Model M-165 Murphy diesel which Toche Shipbuilders, Biloxi, Miss., are installing in his new trawler. The diesel is rated at 165 hp.

VALLEY BAPTIST Hospital, Harlingen, Texas, is having Lawrence Electric Co., Harlingen, install as standby power a completely automatic Stewart & Stevenson Model 6GD100 generator set, rated at 100 kw. The generator is driven by a Model 6030C, 6-cylinder GM diesel.

ASSOCIATED Pipeline Contractors, Inc., Houston, bought from Mustang Tractor & Equipment Co. two Model D311 Caterpillar diesel-electric sets of the self-regulator type. The company will use them to supply power on a pipeline spread.

A Show you'll never forget!

GENERAL MOTORS POWERAMA

Gala Celebration of the 100 Millionth GM Diesel

LAKE SHORE SOUTH, CHICAGO—AUG. 31ST THROUGH SEPT. 25TH

GM Powerama presents—"roads a-building" exhibit of GM Diesel-powered equipment for both concrete and asphalt highway construction—dump trucks, concrete paver, rock crusher, graders, rollers and scrapers.

MAKE your plans now! The General Motors Powerama will be a national event too important, too spectacular to miss.

On 20 acres of grounds, a World's Fair of Power will unfold wonders galore. Fascinating exhibits—thrilling demonstrations—a colorful stage show—everything to make your visit interesting, educational and well worth the trip.

Come and bring the family. *Admission free!*

Plus many other interesting exhibits you won't want to miss—

ALLISON TURBO-JET and TURBO-PROP engines that power America's finest, fastest fighters and transports.

CLEVELAND DIESEL engines powering a submarine you can go aboard and inspect.

ELECTRO-MOTIVE's advanced lightweight 100-mile-an-hour train with its amazing new air-suspension springing.

EUCLID's full line of 10- to 50-ton Diesel trucks and 7- to 18-yd. scrapers.

FABRICAST's exhibit of modern casting methods.

GMC Diesel trucks and coaches, SceniCruiser and spectacular new "L'Universelle."

And a Complete Exhibition of GM's 7 Dazzling Dream Cars:

CHEVROLET BISCAYNE • PONTIAC STRATO STAR • OLDSMOBILE "88" DELTA • BUICK WILDCAT III • CADILLAC ELDORADO BROUGHAM LA SALLE II SEDAN • LA SALLE II SPORTS CAR

GM DIESEL POWER

DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS • DETROIT 28, MICHIGAN

In Canada: General Motors Diesel, Ltd., London, Ontario

T. J. FALGOUT, Galveston, has equipped his self-propelled service barge with two Model 122203 tandem twin-six General Motors diesels which will drive twin screws through 5:1 hydraulic reversing and reduction gears. The barge also has two Stewart & Stevenson Model 3MD30 generating sets, rated at 30 kw. The generators are driven by Model 3061A General Motors diesels.

SAM THOMAS Motor Co., Hobbs, N. M., is repowering a Dodge Power Wagon with a Model 190DLC Waukesha diesel, rated at 72 hp at 2000 rpm. The diesel was secured through Waukesha Sales & Service, Inc., of Houston.

HUMBLE OIL & Refining Co., Houston, is equipping its converted Coast Guard cutter with two General Motors quad-six Model 24003-B diesels, to drive through 5:1 hydraulic reversing and reduction gears. The cutter will also carry two Stewart & Stevenson Model 6GD60 ac generator sets, each driven by a General Motors 6-cylinder diesel and delivering 60 kw.

HUNT TOOL CO., Houston, bought from Big 3 Welding Equipment Co., Houston, a 300-amp Lincoln welding generator, powered by a General Motors diesel. The generator will be used in shop fabrication at the company's Houston plant.

U. S. AIR FORCE bought four Stewart & Stevenson generating sets, each powered by a General Motors Model 122403 twin-six diesel. The diesels and generators are unitized on structural steel skids, for semi-permanent mounting, and are rated at 250 kw.

SEBASTIANO BUZZERO, Galveston, bought, through Houston Engine & Pump Co., Houston, a Model M-135 Murphy diesel, equipped with 5:1 Snow-Nabstedt reduction gear. The 135 hp diesel will power a new offshore shrimp trawler now under construction.

MARINE Construction Co., Patterson, La., is equipping a new 55-ft. steel towboat with two Model 62203 General Motors diesels. The matched pair will drive twin screws through 4.5:1 hydraulic reduction and reversing gears. The same craft will have a Stewart & Stevenson Model 2GD22 ac generating set installed. This 20 kw generator is driven by a Model 2061A General Motors diesel.

U. S. MARINE CORPS bought 71 Stewart & Stevenson 40 kw, ac generating sets, delivering 3-phase, 400-cycle current. The trailer-mounted units are powered by General Motors diesels.

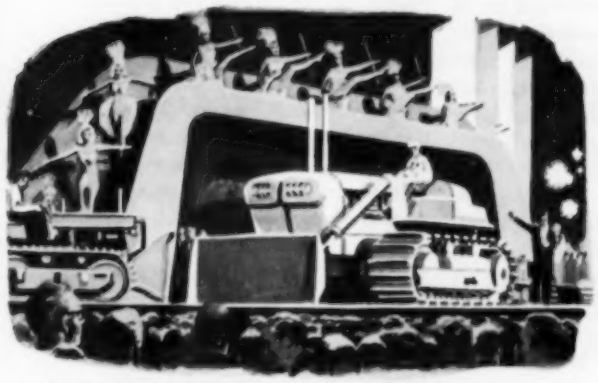
AMERICAN Zinc Co. of Tennessee, Hobbs, N.M., repowered a jeep for underground service with a Model 180-DLC, 38-hp Waukesha diesel, sold by Waukesha Sales & Service, Inc., Houston.

HOUSTON Contracting Co., Quincy, La., bought, through Big 3 Welding Equipment Co., two 250 amp. Lincoln welding generators, each powered by a Hercules diesel.

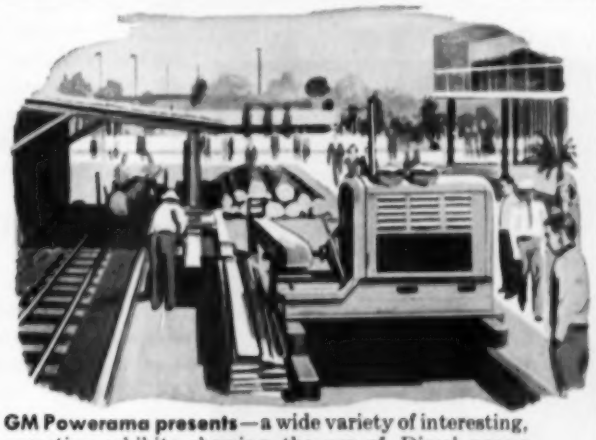
BROWN & ROOT, Inc., Houston, bought a Stewart & Stevenson Model 6GD50 ac generating set, powered by a Model 6030C General Motors diesel. The rated output is 50 kw.

DOWNEY Brothers, Houston, Texas, are having installed in their boat, the *Dux V* a 10 kw ac generating set driven by a Buda BD153 diesel, secured from Buda Engine & Equipment Co., Inc., of Houston.

JACKSON Marine Service, Rockport, Texas, has been appointed a dealer by Buda Engine & Equipment Company, Inc., of Houston. The dealer will specialize in the application and sale of Buda marine diesels and those for industrial and agricultural uses.



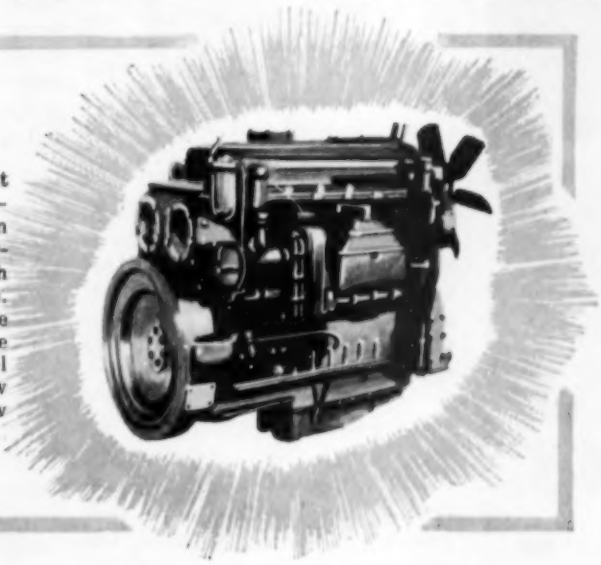
GM Powerama presents—"More Power To You"—a mammoth variety show in which Diesel-powered vehicles perform fantastic maneuvers—with Big Top circus acts and a huge cast of dazzling dancing starlets.

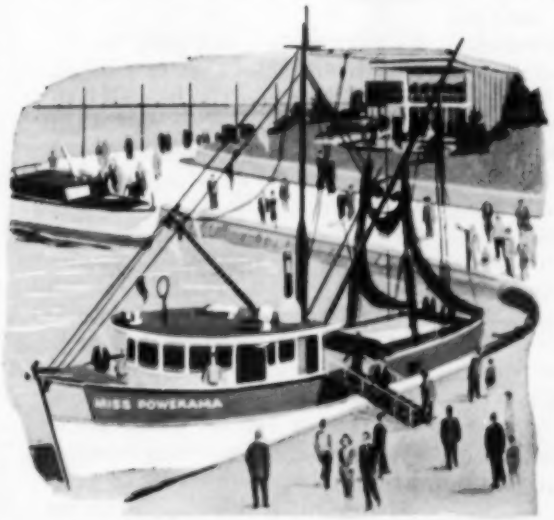


GM Powerama presents—a wide variety of interesting, *operating* exhibits showing the use of Diesel power in many fields including a sawmill, a cotton gin, an irrigation system, a farm tractor and a feed mill.

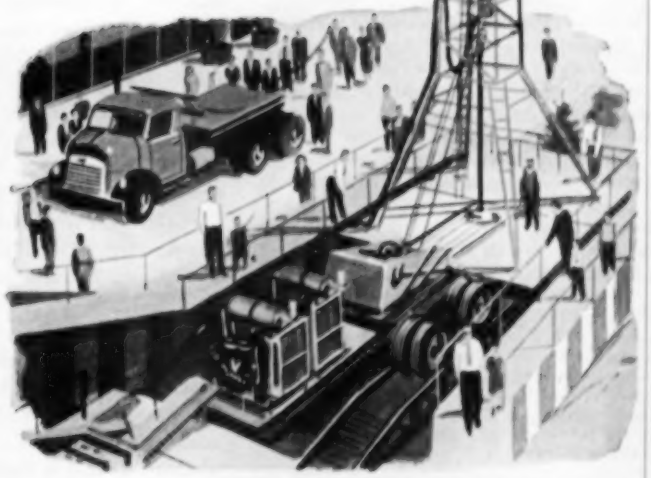
Horsepower

GM Powerama presents—at the head of the parade—Detroit Diesel's golden "6-71" Diesel engine (representing 100 Millionth General Motors Diesel H.P.). Also, Dr. Diesel's first engine and exhibits ranging from the 1933 World's Fair Diesel engine to the compact new "51" engine that opens new fields for Diesel usefulness.





GM Powerama presents—a marine display including GM Diesel-powered shrimp boat and 36-foot and 22-foot pleasure craft for the interest of those who want Diesel safety, speed and economy in their boats.



GM Powerama presents—a modern, portable oil-well drilling rig in action, powered by General Motors 2-cycle Diesel engines which have won a reputation for "more power in less space with less weight."

Inland River Reports

By A. D. Burroughs

WITH THE SEASON'S traditional heat on the inland rivers, Commercial Transport Corporation's boats will be among the most comfortable in operation. Recently equipped with air conditioning in the living quarters are the *LaSalle* and the *Pere Marquette* (both powered by GM engines) and the popular *Samuel Clemens* and *Sam Houston* (powered by Enterprise engines).

THE MORAN TOWING Company has acquired the *Frank W. Banta* from the Plaquemine Towing Corporation and will re-name the boat the *David E. Moran*. Built by Avondale Marine Ways in 1951, this is one of the most comfortable and well-equipped boats in river operation. She is powered by a pair of GM (Cleveland) Model 12567-A diesel engines.

MISSING FROM the Ohio traffic for a number of years, the *Ductillite* returned upbound with a load of coal barges. Built 15 years ago by Dravo Corporation, and owned by Wheeling Steel Corporation, she gets her rated 760 hp at 310 rpm from Cooper-Bessemer JS-6 diesels. Most longtime inland river folks remember this boat as one of the first to have crew quarters below the water line for inland river service.

MISSISSIPPI VALLEY Barge Line's *A. H. Truax* was making even better time than her rated 1650 hp at 280 rpm as she was upbound with steel cargo. In action regularly since 1946, she is powered by supercharged 6 cyl. Superior diesel engines.

THE FAST *Invader*, owned by Industrial Marine Service, Inc., and regular as the sun on these waters was upbound with oil barges. Equipped with two Fairbanks-Morse engines totaling 2000 hp, this unique boat is built on an LSM hull with her upper works from an LSI, a little shortened and towing knees added.

THE POWERFUL *A. M. Thompson*, owned by MVBL and built by Calumet Shipyard and Dry Dock Corp. in 1949 was upbound with 12 barges. Regularly seen in these parts she is powered by Enterprise 8 cyl. 16x20 diesels with Kort Nozzles.

THE TWO-YEAR-OLD *Cap'n Bill Stump* was also upbound with asphalt. Owned by Kanawha Sand Co., built by Hillman Barge and Construction Company, this popular boat is equipped with Atlas Model 35-S 2x6 diesels, rated at a total 580 hp, Snow-Nabstedt reduction 3-to-1. She gets her name from the well-known Capt. W. T. Stump.

WE MISSED seeing the *Codrington* reported downbound near Clarington, Ohio. Built in 1945 by Nashville Bridge Company for General Motors Corporation, this boat is named for the former vice-president of that firm, Mr. George Codrington. Its rated 1200 hp is developed from GM engines.

WE DID SEE, however, the new Ohio River Company's towboat, the *A. L. Long* in action near Gallipolis. Recently completed by St. Louis Ship, this new addition is rated at 2100 hp, from Baldwin-Lima-Hamilton engines.

LADY REE, owned by Greenville Transportation Company was downbound with barges of creosote and several empties. Built in 1951, she measures 100x26x 10.5 with GM motors Model 12-567 ATL diesels providing the rated 1800 hp at 744 rpm.

A NEW 1800 hp towboat, similar to the *Lady Ree*, is reported under construction at Greenville for Capt. Jesse K. Brent and associates. This boat is expected to be ready for service by late fall.

THE 300 hp *Robert P. Bonnie* made her appearance with a number of loaded barges. Owned by American Barge Lines, this one was originally the *Bill Wolter*. Fairbanks-Morse OP diesels 8½x10 provide the power for this 6-year-old boat built from an LSM.

ON THE MISSISSIPPI, the *John R. Junkin* owned by St. Catherine Gravel Company and powered by two Caterpillar D13000 diesel marine engines was busy in the sand and gravel traffic.

SUMMER SUN and vacations have brought an increase in river photography. An excellent color photo of the *Irving Crown* came from a Cincinnati friend. This efficient three-year-old boat owned by Material Service Corporation is equipped with Nordberg Supairthermal diesels rated at 1600 hp.

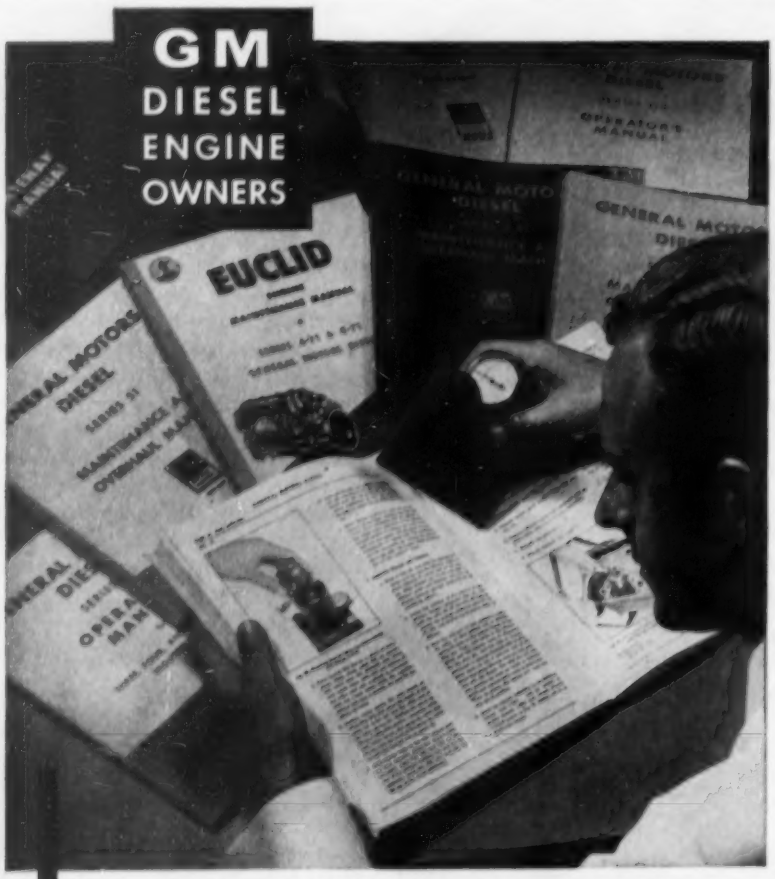
MRS. BILL JESSE mailed in a photo of the Ohio River Company's *W. W. Marting*, showing its elevator pilothouse for the Illinois River. Built 14 years ago, by St. Louis Ship, this boat is rated at 1600 hp from Busch-Sulzer 6 cyl. engines.

A SPECIAL THANK YOU of appreciation to C. J. Johnson for his collection of photos on diesel engines in use on inland rivers. A photo of the Buda engine rated at 150 hp on the 20-year-old *Vance*, owned by Moline Consumers Co., was included.

IN ANSWER to a mail query, the *McBride* is named for J. D. McBride, retired IC supervisor. This boat was built in 1946 by Barbour Metal Boat Works and is now owned by Illinois Central Railroad. Its 150 hp is provided by a Cummins diesel engine.

Assistant To Vice-President

The appointment of John Thomas as assistant to Admiral Wilson D. Leggett, USN, ret., the company's new vice president of engineering, was announced by Alco Products, Inc. Mr. Thomas will be located at Alco's engineering headquarters in Schenectady. Well known in the industry, Mr. Thomas has had an unusual career in that his 36 years industrial experience has been divided almost equally between manufacturing, engineering and sales activities.



YOUR MAINTENANCE MANUALS TELL WHY YOU NEED
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SPECIAL SERVICE TOOLS!

When you bought "GM Diesel Power", Mister, you bought the best! And the one sure way to keep it best is to follow factory-recommended service procedures. You'll find your GM Diesel Maintenance Manuals contain step-by-step instructions . . . clearly written, extensively illustrated. You'll find, too, that wherever required, Kent-Moore "Rate-Maker" Special Service Tools have been developed to give you the means of duplicating factory-assembled conditions in the field. For you see, Kent-Moore Tools are designed in cooperation with your engine manufacturer to perform essential maintenance operations for which no adequate standard tools exist. And they're built to do these jobs better, faster, easier . . . without danger of damaging parts . . . and at lower cost than is possible by means of improvised, makeshift methods. So whether you service your own GM Diesels or have them serviced by others, *make sure the job's done right* . . . with Kent-Moore "Rate-Maker" Special Service Tools!

UPON REQUEST 48-page GM Diesel Service Tool Manual containing complete information on all the Kent-Moore Special Tools required to perform factory-recommended service on GM Series 51, 71, and 110 engines, as used in GMC Trucks and Coaches, Euclid Road Machinery vehicles, as well as in numerous other applications. It's yours for the asking without obligation. Write for your FREE copy today!

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ENGINEERS AND MANUFACTURERS OF SPECIAL AUTOMOTIVE SERVICE TOOLS AND EQUIPMENT

Locomotive Maintenance Officers

A complicated and highly technical segment of a complicated business, locomotive maintenance, will be the subject of the Locomotive Maintenance Officers Association's Annual Meeting September 12 through 14 at Chicago's Hotel Sherman. Prominent leaders in their respective phases of the field will address the meeting and conduct the various discussions.

To be covered are the following subjects: Personnel training, diesel mechanical maintenance, diesel material reconditioning and control, shop planning, diesel electrical maintenance running, shop practices, diesel maintenance—general and the effects of water on various components and the effects of oil in water systems.

These annual exchanges of ideas have been an effective force in spreading new methods and more economical ways of operations in the railroad industry. The September meeting of LOMA is certain to be well attended.

Bus Order Placed

The Ports Authority of Puerto Rico has placed an order for 40 more buses from Mack Trucks according to vice president Elliott G. Ewell. This latest order is in addition to a previous one for 50 buses. It brings the total amount spent for such vehicles with Mack by the Ports Authority of Puerto Rico to substantially more than $1,680,000.

The vehicles are 45-passenger, dieselized units with special glass and ventilating equipment suited to the Puerto Rican climate.

Assigned to Houston Office

The assignment of S. N. Campbell to its Houston Office has been announced by Robert F. Lay, general sales manager of The Cooper-Bessemer Corporation, Mount Vernon, Ohio. In his new capacity, Mr. Campbell will handle the engineering and sales of centrifugal, motor, and engine driven compressors for pipe lines, refineries, petro-chemical, and industrial plants in the Houston area, according to Mr. Lay. A graduate of the University of Texas, Mr. Campbell has served in the Cooper-Bessemer compressor engineering section at the headquarters plant in Mount Vernon, Ohio. He spent a period of time in the Los Angeles area before his present appointment to the Houston Office.

Montana Distributor

Appointment of Tractor & Equipment Company, Sidney, Montana, as distributor and service headquarters for Nordberg Power Chief diesel and gas engines in the eastern third of Montana and the western quarter of North Dakota has been announced by Nordberg Manufacturing Company, Milwaukee 1, Wisconsin. With its main sales and service headquarters located at 201 North Central Street in Sidney, Tractor & Equipment Company also has branch stores in Glasgow and Miles City, Montana. Mr. J. H. Harnish is president and general manager of the organization and Messrs. R. A. Kaneski and J. C. Timmons manage the Glasgow and Miles City stores, respectively. A fully equipped service department that can handle both field and shop work is part of the facilities of the Sidney operation. The firm currently has 10 salesmen and a special oil field representative, Joe Jacobs of Williston, South Dakota.

Water Clarification Brochure

"Get Perfect Water Clarity with Celite Filtration" is the title of a new 12-page, illustrated brochure by Johns-Manville. It covers filtration of potable water, process water and plant wastes. The brochure explains how Celite diatomite filter aids remove colloids and other suspended impurities; shows the adaptability of Celite powders to various types of filter designs; and, cites representative installations where Celite is used to advantage. The latter includes examples of special interest to sanitation engineers, beverage producers, swimming pool operators, plant and power engineers, oil men responsible for clarification of repressurizing water and operators of any business interested in extra water clarity or elimination of pollution and water waste. Copies of the brochure are now available from Johns-Manville, 22 East 40th Street, New York 16, New York. (ITS NEW)

Baldwin-Lima-Hamilton Bulletin

Bulletin #2005, recently published by Baldwin-Lima-Hamilton Corp., Philadelphia, Pa., describes six of the company's standard diesel-electric locomotives which are now fitted with new electrical equipment. Included in the bulletin are tables of complete specifications for performance, weights, dimensions, fuel and other supply capacities, electrical equipment, etc., and tractive effort curves for all six styles. The locomotives listed in the bulletin can fill a wide variety of assignments from general switching to high-speed main line freight service.

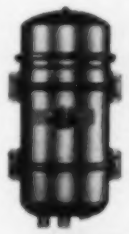
Flexible Connection Catalog

"Expand-Zorber," a complete line of flexible pipe connections used to solve vibration and expansion control problems in industrial and process piping, is described in a catalog just released by T. R. Finn & Company, Inc., specialists in shock and vibration control. The stainless steel, welded diaphram-type packless expansion joint described in the catalog is widely used for absorption of vibration, expansion and contraction in steam, chemical, oil and gas lines. The catalog describes pressure and temperature ranges of application, lists dimensions and specifications, as well as illustrating the various types of special-purpose joints available. Complete selection factors and installation procedures are also given. Copies of this new catalog No. EZ-55 may be had by writing to T. R. Finn & Company, Inc., Industrial Division, Hawthorne, N.J. (ITS NEW)

THERE'S NO SUBSTITUTE FOR LUBER-FINER'S ENGINEERED PROTECTION!

USE ONLY GENUINE Luber-finer DIESELPAKS

YES! IT'S WHAT'S INSIDE THAT COUNTS!
The Efficiency of Luber-finer's Exclusive Patented Process HAS NEVER BEEN EQUALLED!



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2. DIESELPAK—First made available in 1941, the DIESELPAK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!
There is NO substitute for DIESELPAK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!
The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.
IT PAYS TO GET THE BEST!

STANDARD OF THE INDUSTRY SINCE 1936
Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines
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Mid-West Diesel Notes

By L. H. Houck

T. & O. LIME & Rock Co., Sedalia, Mo., has taken delivery on an HD-15C, HD-5G, AD-40 motor grader, two HD-15's with dozers, all Allis-Chalmers with GMC series 71 engines, from Cooke Sales & Service Co., branch at Sedalia.

WATSON Bros. Freight Lines, Omaha, operating more than a thousand tractor-trailer units between Los Angeles and New York, has taken delivery on 40 West Coast International Harvester COE rigs, powered with 200 hp NHB-600 Cummins diesels. These are the first diesels used by this company on the Omaha-Chicago run, although many are used on other routes of their system.

BEMAC Motor Transport, St. Louis, is completing a repowering program on 16 tractors on which gasoline engines are being replaced by 180 hp Cummins Turbodiesels.

HOWARD Construction Co., Sedalia, Mo., has put a new Allis-Chalmers HD20 tractor in service equipped with a pusher plate for pushloading scrapers. Power is a GM 6-71. Howard has another GM Twin 6 driving a rock crusher.

CITY of Wamego, Kansas, has installed a FM 10-cyl. OP dual-fuel, Model 38D-8⅛, 1600 hp engine, direct connected to an FM 1136-kw alternator.

JOHN GERKE, Pilot Grove, Mo., has purchased an Allis-Chalmers HD-9 with dozer and GM 6-71 for use in pond and terrace construction.

A FAIRBANKS-MORSE 2100 hp 31AD 18x27 diesel, direct-connected to a 1500 kw F-M generator, has been installed by the City of Garnett, Kansas.

DAVIS CONSTRUCTION CO., Boonville, Mo., has added two Allis-Chalmers HD-15s with dozers, both equipped with GMC 71 series diesels, to its equipment. Sale was made by the Sedalia branch of the Cooke Sales & Service Co.

SEVERAL NEW diesel trucks have been placed in service by Swift for the meat haul between Omaha and Sedalia, including a GMC tractor with a 6-71 engine, a Mack diesel, and a Diamond T with a Cummins.

MULVANE, KANSAS, has just completed installation of a Fairbanks-Morse 6-cylinder, 12 hp Model 33FD 16x20 engine, direct-connected to an 840 kw F-M alternator.

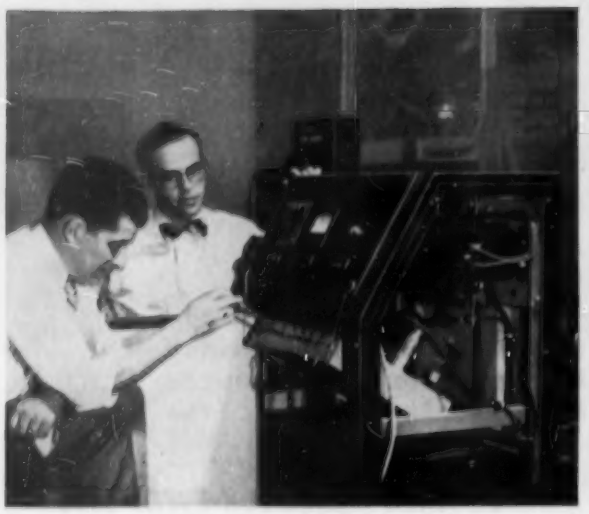
CUSHING, OKLAHOMA, has ordered two 3500 hp Fairbanks-Morse dual-fuel 31AD 18x27 engines which will be direct-connected to 2500 kw F-M alternators, for the new power plant addition now in the planning stage.

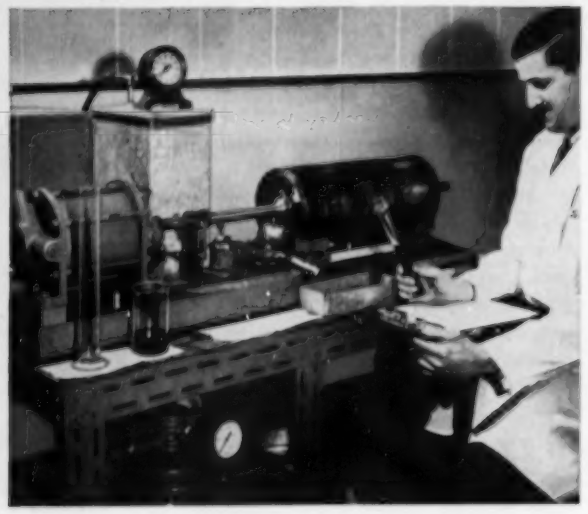
E. W. THOMPSON, owner of a large stock ranch near Sedalia, Mo. has bought an Allis-Chalmers HD-15 with GM-71 engine, for use in terracing and making ponds on his own acreage.

PETTIS COUNTY (Mo.) Highway Department put a new Caterpillar D7 with dozer in service this spring.

ST. LOUIS & San Francisco Railway Co. (Frisco) has chalked up the first million miles for its diesel freight locomotive, Unit 5008, based at Springfield, Mo. In continuous service since June, 1948, it reached the millionth milepost in June, 1955. It was built by Electro-Motive Division of GM and has a Model F-3 EMD engine, delivering 1500 hp at 800 rpm.

CUMMINS Mid-West Co., Omaha, has finished delivery of 22 Cummins JT-6 diesels for repowering International tractors for the Dan Dugan fleet of oil transports based at Sioux Falls, S. D.





New Koppers Development Laboratory tests Piston Rings for longer life . . . better performance!

At the Koppers Metal Products Division, engineers and technicians are at work in a new Mechanical Development Laboratory. Their purpose—to maintain Koppers leadership by improving present products and developing new products and adaptations.

One of the laboratory's primary functions is to design, produce and test new developments in piston rings and metallic sealing rings. This extensive program includes every phase of study from complete metallurgical research to actual engine testing for endurance and operating characteristics. Now and in the future, Koppers American Hammered Industrial Piston Rings will continue to mean *better* piston rings—engineered to give you *better performance.*

The new Koppers Mechanical Development Laboratory will benefit all industry. To put these benefits to work directly for you, consult Koppers whenever you have any problem in piston or sealing rings.

New lab studies all Koppers products

Research and testing under way in the new Koppers Development Laboratory includes: Endurance and operating tests for couplings, engine tests for piston and sealing ring endurance and characteristics, new precipitator controls and electrical equipment, pilot-plant tests of gas flow and distribution . . . and many more developments that will keep *all* products of Koppers Metal Products Division the most advanced in their field.

AMERICAN HAMMERED

KOPPERS ®

Industrial Piston Rings

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC., 1589 HAMBURG ST., BALTIMORE 3, MD. This Koppers Division also supplies industry with Fast's Couplings, Aerotor Fans, Electrostatic Precipitators, Gas Apparatus.

Engineered Products Sold with *Service*

C. C. COVER & Sons, Sedalia, Mo., has added an Allis-Chalmers HD-5-G loader to its fleet with GM 3-71 engine, for basement excavation.

FRISCO Railroad's 160-ton "Big Hook" steam crane has been converted to diesel with two Caterpillar engines from E. A. Martin Machinery Co., Springfield, Mo. Two Cat D-326's provide 186 hp each at 1800 rpm and are coupled to the hoist and swing mechanism through a Twin Disc torque converter.

A 12-YD. Monighan dragline with a 175-ft. boom that once worked on the Panama Canal, owned by Pittsburg-Midway Coal Co., Pittsburg, Kansas, employed for many years as a stripper, has been changed over to Caterpillar power after a number of repowering jobs during its lifetime. E. A. Martin Machinery Co., Springfield, Mo., installed a D-375 V-8 Cat, 325 hp, which is direct connected to a dc generator which supplies power to the electric swing motor. A shop-built hydraulic coupling connected a Cat D-397 V-12, 500 hp engine to the digging mechanism.

ONE OF Allis-Chalmers newest tractors, the HD-11 with the new A-C 516 diesel engine, has been delivered to E. N. Vencil, Sunrise Beach, Mo., by Chiles Tractor & Machinery Co., Springfield, Mo., where it will be used in custom work.

SHEPPARD Lumber Co., Pierce City, Mo., has installed a Cat D-17,000 coupled to a 100 kva generator for use in its hardwood flooring mill. E. A Martin, Springfield, Mo., made the sale.

CITY of Pigott, Ark., has placed an order for a 10-cylinder, opposed-piston Fairbanks-Morse dual-fuel unit for local power production.

Cooper-Bessemer Promotes Two

Two Cooper-Bessemer promotions have been announced. Robert F. Lay, general sales manager of the firm announced the appointment of Albert A. Albright to assistant manager, Marine Sales Section. Ralph L. Boyer, vice president and chief engineer revealed the appointment of Dwight R. Craig as administrative assistant-Engineering Department.

In his new capacity, Mr. Albright will act as the home office representative of Charles M. Reagle, manager of Marine Sales, who is stationed at Cooper-Bessemer's office in New York City.

Mr. Craig's new assignment involves direct responsibility to Mr. Boyer and Mr. E. Fredericks, executive engineer, for coordinating the company's research and development program.

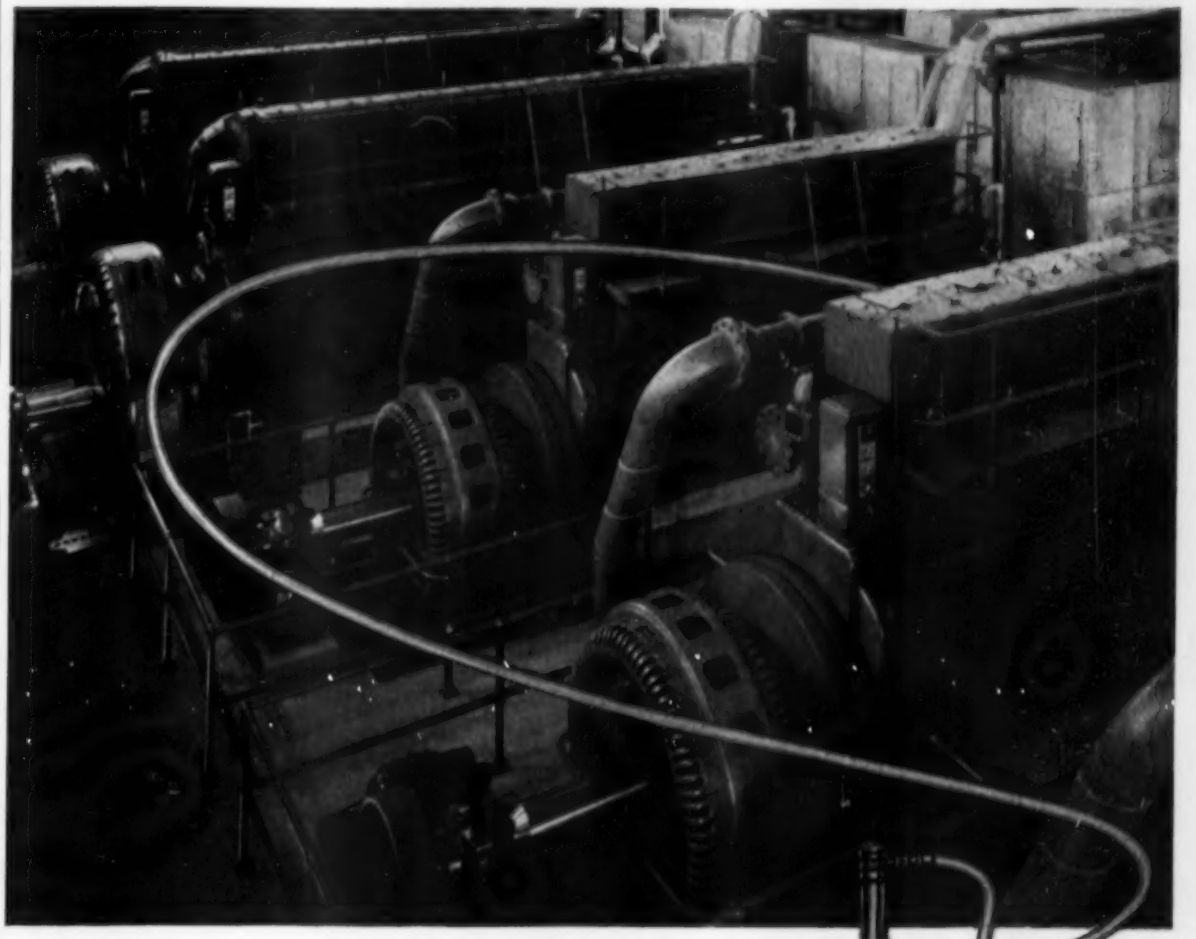
Sales Manager

Michiana Products Corporation, Michigan City, Indiana, has announced that James W. Volk has been made sales manager of their Steel Fabricating Division. The company makes a wide range of farm implements, heavy weldments, road graders, oil filters, fuel tanks and heat and corrosion resistant castings. Mr. Volk has served in the sales department of the division since 1949.

Manager of Department

James B. Morehead has been named manager of the Distributor Department of Mack Trucks, Inc., Elliott G. Ewell, vice president, announced recently. Before joining Mack, Mr. Morehead had been associated with the Studebaker Corporation since 1928, serving as a district manager throughout the South and the Middle West. During World War II, he was commissioned in the Naval Reserve. From February 1951 to May 1955, Mr. Morehead was manager of the Dayton, Ohio, liaison office of Studebaker Packard, in connection with Air Force contracts during the Korean Emergency.

Log More Hours!



Log more hours . . . the *extra* hours of peak performance you get when you switch to Sinclair RUBILENE®. RUBILENE guards diesels against sticking rings and prevents excessive wear of moving parts operating continuously for long periods. You will find that RUBILENE lubrication pays off in lowered maintenance costs and your engines log more time between overhauls.

Switch to Sinclair RUBILENE or RUBILENE H. D. Oils. See the difference it can make in your engine log books. Call your local Sinclair Representative or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, New York.

SINCLAIR

RUBILENE OILS

Mid-Continent Diesel News

By Jack F. Cozier

POOLE CONSTRUCTION Co., Claremore, Okla., has just bought five Euclid 15½ yd. 14TDT scrapers, to be used on the new northeast turnpike, from Butler-Sparks Equipment Co., Oklahoma City. The units are powered by Cummins NHS diesel engines.

ALPHA Portland Cement Co., St. Louis County, Mo., has taken delivery of a Marion 83-M shovel powered by a Buda 6DA-970 diesel with a Torcon 16-CK torque converter. The sale was made by Arrow Engine Sales & Service, Inc., St. Louis, Mo.

LOW COST INSURANCE
FOR DIESEL FUEL
INJECTION SYSTEMS
AMERICAN BOSCH
FUEL OIL FILTER
with AMERICAN BOSCH "FSA"
final stage fuel oil filter
Give your Diesel fuel injection equipment positive protection against damage caused by minute dust and abrasive particles. Install an American Bosch "FSA" Final Stage Fuel Oil Filter. It costs just a few dollars, yet contains an improved water-resistant filtering material that traps all particles that get through primary and secondary filters. The sealed construction is tamperproof . . . installation on any Diesel is quick, easy, inexpensive.
You'll find that the American Bosch "FSA" Filter will pay for itself many times over by lowering maintenance and overhaul costs. For the full story, contact your nearest American Bosch fuel injection agency or write to American Bosch, Springfield 7, Massachusetts.
2931
AMERICAN BOSCH
Division of
American Bosch Arma Corporation

MOORMAN Construction Co., Muskogee, Okla., has purchased one Caterpillar D8 tractor, for construction work on the new northeast toll road, from McCormick Machinery Co., Tulsa, Okla.

JENNINGS Engine Supply Co., Oklahoma City, bought four 6MO-970 Buda natural gas engines for use on a waterflood project in Southern Oklahoma from Buda Engine & Equipment Co., Tulsa.

W. L. SOMNER CO., Shreveport, La., purchased two Buda 6BD-230 diesel units to be built into generator sets from Buda Engine & Equipment Co., Dallas.

POOLE Construction Co., Shawnee, Okla., bought four Caterpillar D8 tractors for road construction work in Ottawa County, Okla., from McCormick Machinery Co., Tulsa.

BELL ENGINE Service, Great Bend, Kan., purchased nine 8MO-1290 Buda natural gas engines for use in irrigation service in Western Kansas. The sale was made by Buda Engine & Equipment Co., Tulsa, Okla.

McEVOY CO., Houston, is having reconditioned by the Platzer Boat Works, Houston, a yacht from Holland. The boat will be powered by two 487-CM P&H diesel engines and one 287-C generator set. The all teakwood vessels will be used as executive boats by officials of the McEvoy Co.

GEORGE E. FAILING Co., Enid, Okla., bought one Buda 6DT-317 diesel engine to power a 1500-S rotary rig from Buda Diesel & Equipment Co., Tulsa.

WALTER BONHAM, oil field contractor, Okmulgee, Okla., purchased one Caterpillar D6 tractor with angle dozer and a Hyster winch from McCormick Machinery Co.

JOY MFG. Co., Dallas, bought two Buda 6DT-468 diesel units for a drilling rig to be exported to Israel. The sale was made by Buda Engine & Equipment Co., Dallas.

DALLAS Railway & Terminal Co. operates 123 White and Southern buses, all powered by Cummins NHHB-600 200 hp, pancake-type, diesel engines with six more on order.

U. S. NAVAL Air Station, Lambert-St. Louis Airport, Robertson, Mo., has taken delivery on a Tournapull "A" powered by a Buda 8DAS-1125 diesel engine. The unit, sold by Arrow Engine Sales & Service, Inc., St. Louis, will be used as a wreck crane.

HALSELL RANCH, Tulsa county, Okla., bought one Caterpillar D7 tractor with a bulldozer to be used for land clearing and pasture reclamation with the sale being made by McCormick Machinery Co., Tulsa.

HILLTOWER, Inc., Cedar Hill, Dallas, purchased a Buda DAA-110A3 diesel 100 kw generator set for standby power at Hilltop's TV transmitting station.

R. W. RINE Drilling Co., Wichita, Kan., purchased through the Bovaird Supply Co., Tulsa, one GM 12103 HD diesel engine from Diesel Equipment Co., Inc., Wichita.

DENVER Amarillo Express, Texas, operates 11 White Cummins-powered trucks, including the Cummins NHB-600, 20-degree tilt, engine which develops 200 hp. The line operates between Amarillo and Denver, Col., and throughout West Texas, New Mexico and Colo.

WALTON Drilling Co., Fairfield, Ill., has repowered a mud pump with a Buda 6MO-970 butane engine sold by Arrow Engine Sales & Service, Inc., St. Louis.

GABLE Electric Co., Dallas, purchased a Buda DAA-110A3 diesel 100 kw generator set which will go to Galena Air Force Base in Alaska. It was sold by Buda Engine & Equipment Co., Inc., Dallas.

COHENOUR Construction Co., Ardmore, Okla., bought one #12 Caterpillar motor grader for road construction work from McCormick Machinery Co., Tulsa.

STICKLE Drilling Co., Wichita, Kan., has ordered two 12103 HD GM diesel engines to power a National T-32 drawworks and a National C-150B mud pump with the sale being made by Diesel Equipment Co., Inc., Wichita.

GASO PUMP & Burner Mfg. Co., Tulsa, bought two 8PC-2505 Buda natural gas engines to power two Gaso Figure 2652 pumps for delivery to a major pipe line company in West Texas. Sale was made by Buda Engine & Equipment Co.

COSMO Construction Co., Tulsa, purchased two more Euclid 15½ yd. 14TDT scrapers, both powered by Cummins NHS diesel engines with 10-speed Fuller transmissions. The sale on these 275-hp dirt-movers was made by Butler-Sparks Equipment Co., Tulsa.

TRANS-TEX Drilling Co., Shreveport, La., soon will put into operation a new drilling rig fabricated by Modern Iron Works, Shreveport, for the National Supply Co. and powered by four Waukesha LRZBU engines. The unit has Twin Disc fluid couplings.

Easy Opening Valve

Vapor Heating Corporation, Chicago, has developed a new, easier to open, steam end valve called the Vapor Steam-Life end valve No. 1127. This valve is designed to be used at the end of railroad passenger cars and diesel locomotives to control high pressure train line steam. A mechanical linkage inside the valve multiplies the lever pressure so that the valve can be opened easily against 250 pounds steam pressure. A positive stainless steel spring-catch locks the valve open so that the valve cannot vibrate closed during rugged railroad applications.

The replaceable disc is made of heat treated stainless steel; the replaceable seat is also of stainless steel. This combination of metals makes a tough, balanced, long-wearing steam-tight surface that resists corrosion and reduces wire drawing thus lowering valve maintenance costs. A stainless steel bleed valve is built right into the disc and the valve may be easily set in a bleed position. The bleed valve is a very important feature; it allows a small amount of steam to bleed out of the end of the last car in the train which is necessary for the steam heating system to work properly. A spring loaded packing on the stem automatically compensates for wear without adjustment. Vapor has also made up a kit of the new 1127 end valve parts that railroads can buy and install in older 2½-in. Vapor 1117, 1118 end valve bodies.

For further information about this new valve and parts kit please write for Bulletins 591 and 591-A, Vapor Heating Corporation Dept. PR, 80 East Jackson, Chicago 4, Illinois. ITS NEW

108
Standard Models

Honan-Crane Multi-Cartridge Filter

Why 108 models of the same basic filter? Because each oil filter application creates individual problems. Scores of variable factors are involved: type of oil, additives, oil viscosity and temperature, flow rate, capacity, space available, nature and degree of contamination, type of heating required, and many more. *All* of these factors must be considered in selecting the proper filtration unit.

Honan-Crane Multi-Cartridge Filters are available in 108 models, ten sizes, and with six *different* types of interchangeable cartridges, each designed to do a special filtering job. Thus, no matter how unusual or difficult the application, you get a filter exactly suited to your requirements . . . and readily adaptable to changing requirements.

The same wide choice of models is also offered in Honan-Crane Bulk Refill and Full Flow type Oil Filters. Custom filtration performance is *standard* with Honan-Crane.

Write for three 8-page Equipment Bulletins:
No. 101—Full Flow Filters
No. 201—Multi-Cartridge Filters
No. 301—Bulk Refill Filters

202 Indianapolis Avenue
Lebanon, Indiana

HH of Indiana

HOUDAILLE HERSHEY OF INDIANA, INC
FILTRATION DIVISION

A SUBSIDIARY OF HOUDAILLE-HERSHEY CORP.

Develops Small, Lightweight, Air-Cooled Diesel

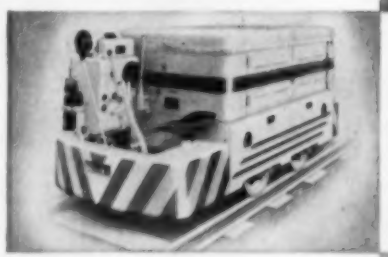
A small, lightweight, air-cooled diesel developing 8 hp and weighing 235 pounds was recently unveiled at a press demonstration by Diesel Power, Inc. According to the manufacturer, a running model at their plant in Greenville, Pa., has racked up over 4,000 hours of continuous operation.

Company president Russell C. Vance plans to run this engine until it fails which is expected to take more than 10,000 hours. The light weight of the engine is attributed to the liberal use of aluminum alloys for such parts as crankcase and blower parts and also to the fact that the air-cooling system eliminates the coolant circulatory parts. The engine is priced in the $250-$300 range and is scheduled to be marketed in October.

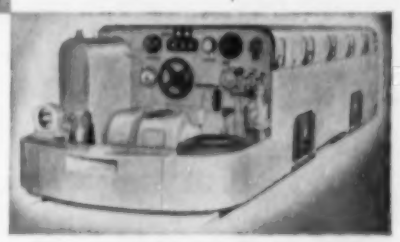
Motor Calculator

A single setting of a new time saving, direct reading Motor Calculator replaces seven operations with a conventional slide rule. There is no chance for error as it is unnecessary to memorize horsepower formulas or rules for determining decimal places. A single setting for any relationship of speed vs torque, gives equivalent watts output and horsepower in decimal and common fractions, also the percent efficiency for any value of watts input. Unlike a conventional slide rule the Motor Calculator circular slide rule makes it possible to visualize the relationships between values and where alternative operating values are possible the best engineering compromise can be selected by inspection thereby saving considerable time. Model FR7 covers a horsepower range from 1/2000 to ½ hp. Other horsepower range models are available. Printed on vinylite in 6½-in. width with 7-in. length cycles for torque and speed. Square base front permits easy handling, stand up storage, no rolling. It is available from Engineering Devices Co., P. O. Box 7741, Chicago 80, Illinois. ITS NEW

POWERED BY 2 CYL. HERCULES DIESEL, MODEL DIXD. This special Ruth Company diesel mine locomotive is one of 5 units in operation in a Tennessee zinc mine. These units pull an average of 16 loaded cars or 28 tons per trip to the mine shaft.



POWERED BY 4 CYL. HERCULES DIESEL, MODEL DOOD. This 5-ton Plymouth diesel locomotive is one of the most recent underground coal mining diesel locomotives to receive the approval of the Bureau of Mines under Schedule 22.



POWERED BY 6 CYL. HERCULES DIESEL, MODEL DWXD. This 10-ton National Mine Service Co. diesel locomotive was the first underground coal mining diesel locomotive to receive approval by the Bureau of Mines under Schedule 22. This was Approval No. 2201.

HERCULES *diesel* ENGINES

The above Hercules Diesel powered equipment has passed the most rigid tests of operations placed on any diesel engine.

The two-cylinder Hercules Diesel powered locomotive has passed the test of time. That is, it has successfully operated for over 6 years in an underground zinc mine. During that time it has not only provided "top-notch" operating economy but also has met safe operating standards set forth by the state and national mine authorities.

The four and six-cylinder Hercules Diesel powered coal mining locomotives have passed the tests established by the United States Bureau of Mines under Schedule No. 22. To illustrate the rigid specifications in Schedule No. 22, it was more than 6¾ years after the schedule was established before any American manufacturer succeeded in developing a design that met all the requirements. This was the Hercules Diesel powered locomotive, illustrated above.

Specify, "Tested and Approved" Hercules Diesels for power and economy. Our sales engineers will be glad to assist you in solving your particular power problems. Drop us a letter, we'd be most happy to work with you—of course, there's no obligation on your part.

HERCULES ENGINES
HERCULES MOTORS CORPORATION
40 Years of Engines for Industry
127 Eleventh Street, S. E. • Canton, Ohio

West Coast Diesel News

By James Joseph

TO QUIGG Bros. Construction Co., Hoquiam, Wash., a Model 2-51, 12.5 kw GM generator set for their dredge, sale by Seattle's Evans Engine and Equipment Co. Inc.

FOR CENTRAL Utah Implement & Hoe Co., Spanish Fork, Utah, a 4-cylinder Fairbanks-Morse model 4984½ power unit, reported by F-M's diesel division manager, C. E. Dietle.

AN LJSW LOGGING truck belonging to John Brunello & Sons has been repowered with a new turbocharged Buda diesel model 6DAT-779, through Hamilton Sales, Inc., for work in the Crescent City, Calif. area.

RECENTLY delivered to Wilson Miller, Pendleton, Ore., a Wagner tractor powered with a 6DT-468 Buda diesel.

DESTINED for construction job sites in Indonesia are five 1500 kw, 2100 hp Fairbanks-Morse model 31A18 diesel generating sets with auxiliary equipment recently delivered to Morrison-Knudsen Co. Inc. Delivery made at San Francisco.

WORKING AT Davis Monthan Air Force Base, Utah, are three new Fairbanks-Morse 200 kw, 300 hp diesel generators (model 32A8½), purchased by Howard P. Foley Co., Salt Lake City.

FOR REPOWERING his sawmill near Centralia, Wash., Lee Johnson has purchased a G-M model 4031C sawmill power unit.

THE SALMON troller *Maid of Bayne*, working out of Renton, Wash., and owned by Dick Palmer, has been powered with a GM-43200 marine propulsion unit. Troller is a 40-footer.

FOR Western Electric Co., Inc., San Leandro, Calif., four 3 kw, model 45 generators with accessories. Diesels are Fairbanks-Morse.

ROGERS Construction Co. and Babler Bros., working a joint Alaska project, have installed a Madsen Model 481, 6000-lb. capacity asphalt mixing plant with 84 in. x 36 ft. dryer and a Model 380 dust collector, wet tube dust washer, asphalt tanks, boiler and pumps. Entire plant is powered with a 500 hp Caterpillar D-397 diesel generator.

FOR LOGAN, Utah's Quality Service and Supply Co., a Fairbanks-Morse 2-cylinder diesel engine unit, Model 48-AS5½.

AT THE Eskimo hamlet (on Alaska's Norton Sound) of Unalakleet, two Model S-7 Euclid Scrapers powered with 4-71 GM diesel engines, for contractor Sam Bergesen.

TO REPLACE a 450 cu. in. gasoline engine in his sawmill at Shelton, Wash., C. H. Rhodes has taken delivery of a GM Model 4031C power unit.

A GM 6-71 Model 6072A marine propulsion unit is repowering Pope & Talbot's tug, the *Peter H.*

TO LEICH Sales Corp., West Los Angeles, Calif., two 180 hp, 6-cylinder Fairbanks-Morse Model 49A4¼ diesel engine units.

LEE BLOOM, East Stanwood, Wash., has repowered his sawmill's buck rig with a GM 43301 unit, via Evans Engine & Equipment Co., Inc.

FOR San Francisco's Pacific Gas & Electric Co., a Fairbanks-Morse 2-cylinder Model 49B4½ power unit.

WORKING on farms around Donnelly, Idaho, for Bill Myers, is a Wagner TR-

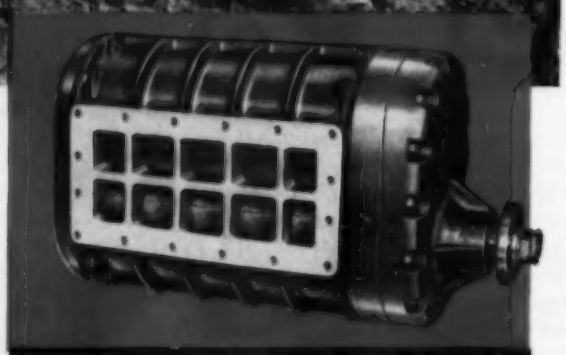
GIANT HD-21 CRAWLER DOZES with M-D Supercharged Power!

ALLIS-CHALMERS STANDARDIZES ON MIEHLE-DEXTER SUPERCHARGERS FOR THEIR DIESEL ENGINES

Like so many leading Diesel engine manufacturers, Allis-Chalmers specifies Miehle-Dexter Superchargers for their engines.

And that's one of the reasons this new giant torque converter driven crawler tractor—the Allis-Chalmers Model HD-21—claims to be one of the most powerful crawlers . . . anywhere! Rough and rugged dozing needs power aplenty. And here's *extra* speed at any load, *extra* pushing or pulling power at any speed, wider speed range and more range overlap—thanks to Miehle-Dexter Supercharged Power.

You, too, can boost the horsepower of your engines by 50% or more . . . and decrease weight per horsepower, too. Miehle-Dexter engineers can specify the exact size and type M-D supercharger for your engines. Standard M-D models available for applications to 750 hp. Write for bulletin.



FOUR FEATURES PROVE MIEHLE-DEXTER SUPERCHARGERS BETTER ON THE JOB

- Patented end plate seals eliminate metal-to-metal contact, assure longer life, help achieve fuel savings.
- Rotor wear strips eliminate contact between rotors and housing, assure longer wear.
- Lightweight aluminum rotors and aluminum case boost engine horsepower, do not add weight, safely allow high speeds.
- All parts are standardized, allowing easy field service and interchangeability.

NOW ON TEST... AN ENTIRELY NEW TYPE OF TURBOCHARGER!

MIEHLE-DEXTER SUPERCHARGER

Division of the Dexter Folder Company

100 Fourth Street • Racine, Wisconsin

14 tractor powered with a Buda diesel 6DAS-516. Another Wagner, this time a TR-6, powered by a Buda 6DT-317, is working for Duane Linden, Goldendale, Wash.

AT SAN BERNARDINO, Calif.'s Norton AFB—as well as at several other Air Materiel Command depots—they're canning ball bearings, like so many ripe olives. It's a new technique, just developed, just put into practice by AF. Advantages: ball bearings may now be canned in their "use grease"—the operating lubricants. AF says no special processing necessary for canned bearings headed for tropical or arctic regions. Same method may one day find use in automotive-diesel industry, particularly for parts bound abroad. Shelf-life is said to be "indefinite."

Gray Marine Catalog

The Gray Marine Motor Company of Detroit announces a new general catalog, now being mailed to every dealer, distributor, boatbuilder, boatyard and naval architect in the United States. The new 52-page catalog, indexed for reader convenience, contains detailed engine data covering Gray's current line of 31 gasoline models, from 16-200 hp, and four diesels, 30-135 hp. Applications, installations, and the complete Graymarine line of optional accessories and equipment are also covered, including Gray's own fresh water cooling systems, Thermogard temperature controls, water-cooled exhaust elbows, power take-off, and many others. (ITS NEW)

Torque-Coupling

The Techniflex Corporation of Port Jervis, New York has announced the release of its newly designed torque limiting coupling, which is a mechanical device for controlling and fixing the maximum torque transmitted from a driver to a driven machine. Up to the limit to which it is adjusted, the torque coupling behaves like a conventional flexible coupling. Beyond this adjusted limit, the coupling permits a free wheeling or slip effect between the driving and driven halves of the coupling.

Two important functional properties claimed with the developed free wheeling or slip effect are (a) the ability to use the de-coupling action in tripping a safety or emergency switch, (b) the ability to apply the repetitive detent action on which the slip effect is based towards a repetitive "hammer-blow" effect, and (c) its ability to work as a bi-directional torque coupling with independent torque rating for each direction if required. Couplings are available in standard nominal rating from 24 inch-lbs. to 100,000 inch-lbs. All couplings are readily adjustable from 50% to 150% of their nominal ratings. Additional detail data available on request from the company. (ITS NEW)

Named To Research Division

Dr. Henry Carroll, nuclear physicist, has joined Allis-Chalmers research division, according to an announcement by Dr. Harry K. Ihrig, vice president in charge of research. Dr. Carroll has had wide experience as a research scientist and was associated with various management engineering and industrial concerns before coming to Allis-Chalmers. He is a member of the American Physical Society and the American Society of Mechanical Engineers.

IT'S HERE! JUST OFF THE PRESS! Bigger, better, completely revised, rewritten and brought up to date. It's Volume 20 of DIESEL ENGINE CATALOG, now ready for mailing. Mail orders are now being filled for this giant reference book with its all-new, profusely illustrated engine and accessory sections. Be sure of your copy of this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company form orders to DIESEL PROGRESS, Cole Station, Los Angeles 46, California.

There's a Torcon unit to meet your job requirements

Here is a complete line of torque converters designed to meet a wide range of engine applications in all industrial fields.

The Clark Torcon unit is a three-element single stage converter of simple design, mass-produced. It is available off-the-shelf to owners and operators of equipment, as well as to manufacturers.

HORSEPOWER RANGE
. . . 15 to 600

DIAMETERS
. . . 11" to 26"

COMPLETE CHOICE
of options for easy fit into practically any torque transmission system.

For full information refer to illustrated easy-to-read Torcon bulletin.

CLARK EQUIPMENT

This helpful bulletin describes TORCON advantages . . .

Send for it

- **True Hydra-Foil Blade Design**
  —a patented feature. Correct combination of blade contour and angles assures smooth oil flow, for most efficient torque multiplication. No cavitation to cause turbulence or air pockets which impair efficiency and cause destructive wear.
- **Self-Contained Oil Circuit**
  —Sump is cast integral, and oil passages are cored in the housing. No unnecessary hoses and fittings; no external oil seals under pressure.
- **Easy Accessibility**
  —Inspection plates are easy to get at; no special tools needed.
- **Individually Cast One-Piece Elements**
  —no welds or fabrications to distort under extreme loads.

Every user of horsepower will find this bulletin well worth reading. The coupon brings your copy promptly—no obligation.

CLARK EQUIPMENT COMPANY
Jackson 2, Michigan

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Firm_____

Address_____

City_____ Zone_____ State_____

Marquette Metal Appointments

Merrill A. Young

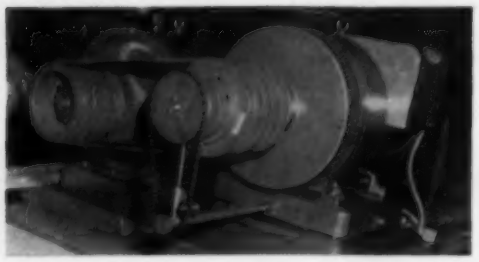
John L. Fuller

Two new appointments at The Marquette Metal Products Co., Cleveland, have been announced by Fred E. Harrell, president and general manager of this Curtiss-Wright subsidiary. Merrill A. Young has been named works manager. For the past year and a half he has been engaged in a private consulting practice, and earlier he was with Clevite Corp. and The Cleveland Graphite Bronze Co.

John L. Fuller has been appointed to the newly created position of director of engineering, in charge of all product engineering and quality control. He formerly had been with Reliance Electric & Engineering Co., for 19 years. Jerry Gleitz has been transferred to the post of manufacturing engineer and will give primary attention to an intensive program of cost reduction.

The Marquette Metal Products Co. makes a wide variety of products of its own design, including aircraft windshield wipers, textile spindles, engine governors, rotary pumps and spring clutches. In addition, the company makes precision machined parts for many diversified industries.

New Motor Generator



The Kato Engineering Company of Mankato, Minnesota, has recently developed a new motor generator set in response to the ever increasing demand for 400 cycle power. The unit consists of a 60 cycle, induction motor of low slip design driving a 31.25 kva, 25 kw, 380-420 cycle generator. Exact frequency changes are accomplished through a simple hand crank adjustment. Design features include: 1. Harmonic distortion of less than 2.9%. 2. Fast voltage recovery (less than .3 sec.). 3. Voltage regulation to within ½%.

The unit specifically matches requirements of precise frequency and voltage control along with ample reserve capacity. It is available on all standard voltages and also many special voltages upon application. The Kato Engineering Company has been manufacturing electric machinery since 1928. Machines ranging in capacity from 300 watts to 400 kw are available. The company makes rotary converters and both dc and ac motors in various sizes. (ITS NEW)

Vice President-Sales

John H. Flaskamper

John H. Flaskamper, former manager of Fuel Injection Sales, has been advanced to the post of vice president-Sales of American Bosch Division, American Bosch Arma Corporation. He replaces Donald H. Spicer who recently resigned to join Morse Chain Company as vice president in charge of sales. Mr. Flaskamper has been associated with American Bosch for the past 21 years in various capacities including those of field engineer, assistant manager of manufacturers sales and New York branch manager prior to his promotion in 1953 to manager-fuel injection sales. He is a member of the Society of Automotive Engineers.

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DIESEL ENGINE CATALOG

The purpose of this little advertisement is to tell you about Volume 20 of DIESEL ENGINE CATALOG which is now available, entirely revised and rewritten. This is the 20th edition of the book that has earned the name of "the bible of the industry."

All smart diesel engine salesmen carry this book around in their car. When they run into some new competition with which they are not too familiar, the DIESEL ENGINE CATALOG gives them full, accurate information when they need it most.

The consulting engineer keeps this book in his reference file. It immediately gives him *all* data on diesel engines coming within a given horsepower range, speed range and weight range.

People who sell, people who buy, people who use diesel engines need this new, fully illustrated, up-to-the-minute volume. It has been completely revised and expanded. Orders are now being accepted for this latest edition. Price $10.00 prepaid.

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Straws in Todays Business News

CURRENTLY, some of the best diesel news emanates from the railroads. Canadian National ordered 173 diesel units worth about $25 million from four companies: Alco Products, three 1000-hp switchers; Canadian Locomotive, 20 1200-hp switchers; General Motors, 32 1200-hp switchers and 45 1750-hp road locomotives; Montreal Locomotive Works, 23 1600-hp road engines and 50 1000-hp switchers. . . . New York Central ordered 61 diesel locomotives to cost $9,601,000 from GM's Electro-Motive Division, 45 general purpose units of 1750 hp and 16 900-hp yard switchers. . . . Louisville & Nashville is spending about $5 million on 30 general purpose diesel units, 20 from Alco Products at 1600 hp each, and 10 1750-hp Electro-Motive locomotives. . . . Reading Co. has ordered six general purpose, 2400-hp Fairbanks-Morse Train Masters to cost $1,500,000. . . . General Electric has a $5 million order for 40 diesel-electric locomotives with Cooper-Bessemer engines for Manila Railways in the Philippines. . . . Association of American Railroads reported major railroads placed 599 new locomotives in service in first half of 1955, all but one electric unit being diesel-electric.

ALCO Products reported shipping almost as many diesel locomotives in first half of 1955 as it built in all of 1954. Orders on the books include four 1600-hp road switchers for the coal-hauling Norfolk & Western, 10 1600-hp road switchers to complete dieselization of the Long Island Railroad, plus units for Chicago & Northwestern, Central of Vermont, Grand Trunk Western and others. Export business is also up and includes 24 900-hp switchers for Del Pacifico of Mexico, 14 all-purpose units for Spain, and additional locomotives for Pakistan to which country 17 1600-hp road switchers worth $2,500,000 recently were shipped.

U. S. ARMY recently demonstrated a new direct-drive locomotive built to its specifications by Baldwin-Lima-Hamilton. The 48-ton unit is powered by a single Caterpillar diesel, driving through a mechanical transmission. Objective is a locomotive that will not require use of critical materials, and one that can be easily maintained.

ENTERPRISE Engine & Machinery Co., according to authentic sources, has been awarded a contract of $1,500,000 to supply engines for the big U. S. Air Force Base being constructed in Spain. . . . C. A. Pitts, Canadian subsidiary of Merritt-Chapman & Scott Corp. was low bidder—at $11,700,420—on a St. Lawrence Seaway contract to remove 14,500,000 cu. yds. of earth and 1,000,000 cu. yds. of rock from a 3-mile stretch of the river. . . . Permanente Cement is moving into the booming Southern California market from the northern part of the state and will erect a 12-million-dollar cement plant near Lucerne Valley.

EXTENSIVE expansion activities continue in the gas transmission industry. . . . American Natural Gas obtained SEC approval of financing plans for a pipeline to be built between Louisiana and Detroit which will cost about $130 million. . . . Texas Eastern Transmission Corp. has been authorized to increase its pumping capacity and install an 11-mile loop in the Philadelphia area at a total expenditure of nearly $6 million, including a project of its subsidiary, Texas Eastern Penn-Jersey. . . . Southern Counties Gas Co. of California has state approval for building 31.5 miles of 30-in. line at a cost of about $2.5 million. . . . Southern Natural Gas Co. has petitioned the Federal Power Commission for permission to construct new facilities in Georgia and Louisiana to cost about $2.1 million. . . . Transcontinental Pipe Line Corp. has authority to spend about $3.4 million on additional natural gas facilities.

GUATEMALA has obtained a loan of $18.2 million from the World Bank to help finance the importation of equipment, materials and services necessary to accomplish a road improvement program estimated to cost $40.2 million.

HOUSTON is to test the practicality of a monorail transit system to overcome surface traffic congestion. A $50,000, half-mile pilot line is being built. A diesel will power the gyroscope-balanced car which will travel 30 ft. above ground at 60 mph. . . . Union Pacific recently dedicated its six-million dollar diesel repair and maintenance center in Salt Lake City. Both its diesel and gas-turbine locomotives will be overhauled there.

PURE OIL recently announced a new natural gas discovery 11 miles offshore from Galveston. The gas was reached from a platform standing in 50 ft. of water. The new well flowed at an estimated rate of 19 million cu. ft. per day. . . . Allis-Chalmers recently introduced its first line of farm tractors powered by the six-cylinder diesel the company manufactures at its Harvey, Ill. Buda plant. There are three models of farm tractors. . . . Elliott Co. recently transferred the motor and generator activities of its Crocker-Wheeler division to its Jeannette, Pa. plant and sold its Ampere, N. J. factory buildings to the Worthington Corp. . . . Two West Coast subsidiaries of De Laval Steam Turbine Co. have jointly occupied new, $600,000 quarters at Millbrae, south of San Francisco. The De Laval Turbine Pacific Co. manufactures marine and industrial pumps and filters, and the De Laval Pacific Co. makes farm equipment.

Factory Representative

Nicholas A. D'Arcy, Jr.

Nicholas A. D'Arcy, Jr., of 7821 State Street, Huntington Park, California, has been appointed factory representative for Clark Equipment Company's Automotive Division, according to an announcement by C. H. King, Clark vice president. Mr. D'Arcy will handle Clark's complete line of axles, transmissions, torque converters and complete power trains in San Luis Obispo, Kings, Tulare and Inyo counties in southern California, Clark county in Nevada and in the state of Arizona. Assisting Mr. D'Arcy are George Riley and John Eber. Mr. D'Arcy has been a manufacturer's representative for the past ten years, specializing in the application and installation of torque converters and hydraulic drives to machinery and trucks.

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See for yourself the vast difference in this patented all cellulose disc-pac filter cartridge . . . see for yourself a new and modern full-flow filter tank with all controls completely visible at eye level. See how tools are entirely eliminated. SEE ALSO what vast economies in piping . . . in operation and how engine repairs and down-time are CUT TO THE BONE.

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What's Going On In England

By Leo Walter

IT IS CLAIMED by the chairman of Rolls-Royce, in his review of the past year, that the oil engine division of this firm is making good progress in a highly competitive export market. He said the Rolls diesel engine, which is more in line with American than with British practice, is rapidly gaining ground despite being dearer than most other similar types.

A NEW FIRM, Ashok-Leyland Ltd., has been formed in India for the manufacture of certain types of diesel engines of the design of Leyland Motors Ltd. The Indian firm may develop vehicles powered by diesel engines specially suitable for the Indian market, but local competition from German enterprises will have to be met.

THE BRITISH firm of W. G. Bagnall Ltd., locomotive builders of Stafford, have entered into an agreement with Morison & Bearby Ltd., of Newcastle, Australia, covering the manufacture of shunting locomotives. As is well-known, Bagnalls specializes in diesel-mechanical shunting locomotive designs, and these will be modified to suit local Australian conditions.

THE HYMATIC Engineering Co. Ltd., of Redditch, Worcestershire, England, introduces a new compressed air system for starting 2-stroke, or 4-stroke diesel engines of up to 20 bhp per cylinder output by means of an outfit, consisting of compressor, air receiver and directly operated injector valves. The latter has about the same dimensions as a normal sparkplug and it is claimed that provision for it in the design of a small diesel cylinder head can easily be made.

SOME OF the ways in which manufacturers in the British diesel locomotive industry are tackling their problems are the subject of "The Wheels of Progress: A Review of Productivity in the Diesel Locomotive Industry," published by the British Productivity Council, 21 Tothill Street, London SW1. It is the 15th in the series reviewing the progress of manufacturing industries since sending productivity teams to the Uinted States under the auspices of the Anglo-American Council on Productivity.

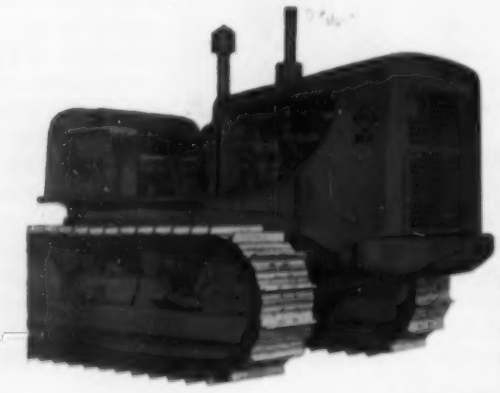
HEAD-WRIGHTSON PROCESSES Ltd., working in association with The Fluor Corp. of Los Angeles, reports increased sales of Fin-Fan air-cooled heat exchangers for diesel cooling. A number of plants have come into operation in arid regions where water is either scarce or costly. In a brochure, "Modern Trends of Diesel Cooling," the basic principles and the advantages of Fin-Fan heat exchangers are set out in a concise way for the diesel user.

DURING THE last war, including supplies from the United States, over 400 different types of internal combustion engines were in use in British Admiralty service. After the war, the British Admiralty, in collaboration with the British Ministry of Supply, aimed for a policy of standardization. Power requirements from 2000 hp down to the smallest units were divided into four ranges. It is learned that great progress has been made with standardization of spare parts. Cooperation with NATO countries is also progressing.

IN A RECENT PAPER, J. E. Church, superintendent of the South-American Saint Line Ltd., Cardiff, advocated the design of cheaper and more reliable marine machinery, and favored combinations of diesels with steam aboard ship. An interesting graph showed that operating costs of a typical 10,000 ton 14-knot cargo ship as a percentage of total voyage expenditure show that depreciation forms nearly as great a part of finance as the fuel used. Comparison was made between twin-geared diesel, combined geared steam and diesel, triple-expansion steam and diesel and direct-drive opposed-piston motorship with gas and steam turbine drive, and with high-pressure turbine steamer.

ENGLISH Electric Co., Ltd., Rugby, claims having supplied the largest diesel-operated factory generating plant in the British Isles. It is in use at Leylands Motor Co.'s factory and consists of 16-cylinder, 1000 kw diesel alternator sets for continuous power generation. Another part of the plant has six-cylinder sets of 265 bhp, each driving Alley & MacLellan air compressors for factory air services.

HIGHER power-weight ratio and more economic fuel consumption are among the advantages claimed for the new improved "Tiger Cub" diesel engine by Leyland Motors Ltd. Known as the



United Air Cleaner Protects New Allis-Chalmers Tractor

This new Allis-Chalmers HD-16 crawler tractor is ready to wade into the dusty atmosphere of construction jobs, mining, bulk material handling work, etc. — it is protected by a United Oil Bath Air Cleaner. Even under the grittiest work conditions only clean, abrasive-free air will enter the combustion chamber of its powerful new engine. The protection furnished by the United Cleaner adds hundreds of hours to the life of engine parts.

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0/350 Mk. III, it is intended for use in the low-weight Tiger Cub underfloor engined autobus and coach chassis. It is said to develop 105 bhp at its maximum governed speed of 2400 rpm. This compares with 90 bhp at 2200 rpm in the earlier model.

TURNER MFG. Co. Ltd., of Wolverhampton, announce two models now available of their lightweight 2-stroke supercharged diesel engine. They are the Turner 2-cylinder type L-40 and the 3-cylinder type L-60, both in full production in large series. The L-40 fitted in a 6-seater car is said to have achieved over 45 miles per gallon during a recent test, supervised by engineers of the British Automobile Association. The specific weight is claimed to be only 8 lbs. per horsepower for 3-cylinder models, and great compactness enables easy fitting into cars and trucks.

ENGLISH Electric peak load equipment was recently installed at the Clacton generating station of the Central Electric Authorities near London. The SV-type is a 12-cylinder engine of Vee-design with 10 in. bore and 12 in. stroke. Twin Napier pressure turbochargers are employed for providing 1350 bhp at 750 rpm.

AN ILLUSTRATED new booklet entitled "Flow Production of Heavy Diesel Engines" has been announced by Messrs. Mirrless, Bickerton and Day Ltd. of Hazel Grove, Cheshire, England and describes and illustrates modern flow production methods of the Mirrless diesel units.

RUSTON & HORNSBY, Ltd., of Lincoln, report increasing export sales. The largest diesel engine for export to leave their Lincoln works in one piece was recently shipped from Liverpool to Canada, where it will serve near Vancouver, installed in a dredge. It has 1560 bhp and is a marine auxiliary design. For the road transport to the shipping port, the engine was dismantled and then reassembled on the low-loading special vehicle in four days. The dispatch as a completely assembled unit was undertaken upon request by the customer.

FORD'S BRITISH factory at Dagenham near London, England, announces completion of its 100,000 tractor fitted with a Ford diesel engine, after only three years production of diesels in England. It is claimed that present production is about 7000 Ford diesels per month, mainly for farm tractors. Preference for diesel drive is nearly 100% in favor as against alternative power units for the British home market.

Injector Reconditioning Plant

A few of the modern and exacting precision machines used in the reconditioning of Stewart & Stevenson "remanufactured" injectors.

One of the best-equipped injector reconditioning plants for General Motors diesel engines in the Southwest is operated for Stewart & Stevenson Services, Inc. by C. F. Beal near their San Juan, Texas, branch. This operation remanufactures and reconditions GM Detroit Diesel Engine Division injectors for all Stewart & Stevenson branches and other General Motors Diesel distributors and users. Built exclusively for injector repair service, the shop was started at the Rio Grande Valley location two years ago. The reconditioning department is housed in an air-conditioned, dust-proof building. The most modern methods of cleaning and inspection of parts are used.

Equipment includes a stand for testing and running-in each injector as it is built, precision hones, and centerless lapping machines for reconditioning plungers and bushings. In addition, to insure perfect fitting of the various parts used in remanufacturing Series 71 and Series 110 injectors, special air and electronic gauges are used which measure in the millionths of an inch. All procedures are set up in accordance with the exacting standards of the GM Detroit Diesel Engine Division.

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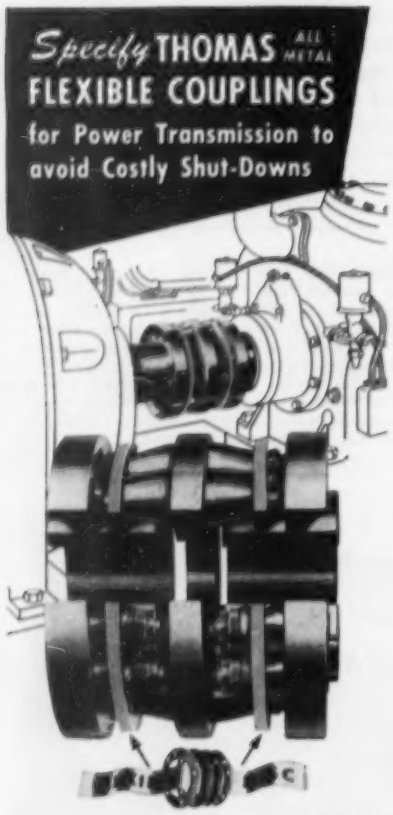

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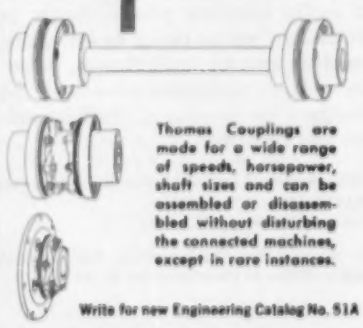
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



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European Diesel News

By Leo Walter

THE GERMAN firm of Klockner-Humboldt-Deutz A.G. is continuously extending its export organization and aims to come back to its old-established pre-war export outlets. Its London agent, A. Kracko Ltd., covers Great Britain, and holds spare parts and a full stock of Deutz diesel engines.

YUGOSLAVIA started last year making tractors in a new factory near Belgrade, called Yugoslav Industrija Motora Rakovina. The diesel engines used, however, are purchased in England from F. Perkins, Ltd., of Loughborough. The first order is said to be for 2400 Perkins engines of the type P4 to be offered as standard in the new Zadrugar tractor.

NYDQUIST & HOLM A.B. of Trollhattan, Sweden, has introduced a combination of the Nohab L-series and the Polar M-type under a new type number MN 16 for naval purposes. This is a six-cylinder unit with a bore of 340 mm. and a stroke of 570 mm. It is announced that a single cylinder prototype unit has been tested at the Trollhattan works. A Napier turbocharger of British make has been fitted for endurance and capacity tests.

DEVELOPMENTS of the TOP turbocharged opposed-piston unit at Aktiebolaget Gotawerken, of Gothenburg, Sweden is said to be satisfactory. While intended primarily for light, fast ships, the use of these 10-cylinder units, having a maximum shaft horsepower of 3000 bhp at 975 rpm, includes railway work, and other installations. Remarkable is the weight of 5.8 lbs. per hp for this exhaust-turbocharged design using compressed air at 23 psi gauge.

MESSRS. GRAF & STIFT Automobilfabrika A. G., Vienna, Austria (in which firm the writer served his apprenticeship many years ago) are using with their diesel engines for heavy trucks "Twiflex" flexible couplings and automatic clutches. Their 510 cbc/ft. 6-cylinder compressor is coupled to a Graf & Stift diesel transmitting 100 hp at 1500 rpm for shockless power transmission. Metalastik ultra bonded rubber bushes are used.

THE GERMAN Klockner-Humboldt-Deutz A.G. is said to be carrying out some interesting development tests on a 2-stroke diesel equipped with an exhaust turbocharger. The engine has port scavenging and possesses a Schuerle reverse scavenging system without non-return valves after the charging valves. The engine operates on the Brown-Boveri-Curtis principle at constant pressure, in which the turbocharger is connected ahead of the normal scavenging blower. The engine has four cylinders of 220 millimeter bore and 330 mm stroke at 500 rpm. It develops temporarily 375 hp corresponding to a mean effective pressure of 6.75 kg./cm.sq.

BOTH TWO- and three-cylinder Deutz diesels have been built into a new mechanical shovel manufactured by the German firm of Ahlman-Carlshuette K.G. of Rendsburg. The mechanical shovel is mounted on four large pneumatic wheels having water ballast drive on the front. The Deutz engine is air-cooled, developing 30 or 45 bhp, respectively, at a governed speed of 1600 rpm.

IN AN ISSUE of "The Brown-Boveri Review" of Baden, Switzerland, this leading firm for development of exhaust-gas turbochargers for 2-stroke diesel engines predicts that within the next year the pressure-charged 2-stroke engine will dominate the European market in precisely the same way that pressure charging has now become supreme in the field of 4-stroke engines. The author states, however, that the exacting demands which pressure-charging imposes with regard to aerodynamically correct flow within the engine will definitely require an all-round improvement in the design of the diesel engine of the future. The use of the pulse system offers advantages, the author says, over the constant-pressure system in the range of medium charging pressures, and, being most suitable for uniflow-scavenging types, will probably increase rapidly. It is claimed that operation with heavy oil does not become complicated by pressure charging. In practical experience it is claimed that, on the contrary, increased air density improves combustion.

BROWN-BOVERI exhaust-gas turbochargers have been installed, among others, in the Danish motor tanker *Dorthe Maersk*, owned by A. P. Moller, and was the first ship in the world to have its power raised by about 35% to 750 hp by the use of an exhaust-gas turbocharger on its 2-stroke Burmeister & Wain diesel engine. Other installations comprise a cross-scavenged Fiat 8-cylinder engine of 5300 bhp, built by Stabilimenti Grandi Motori Fiat at Turin, Italy. Another unit is a Stork Bros. & Co. N.V. Hengelo (Holland) 2-stroke engine of about 9000 hp and 8-cylinders, installed at the Dutch M.S. "Ouwerkerk." The Oranje Line, Rotterdam, Holland, operates their liner, *Prins Willem van Oranje*, with 12 uniflow-scavenged cylinders at 9600 hp at 125 rpm with two BBC turbochargers. Finally, the Japanese firm of Hitachi Shipbuilding & Engineering Co., built under license a Burmeister & Wain for the Yamashita Shipping Co. and a turbocharger increased the capacity of the 6-cylinder diesel by about 35% to 7500 bhp.

Chief Engineer

Ronald C. Beckett

Michiana Products Corporation, Michigan City, Indiana, producer of diesel lube oil filters for locomotives and other large power units, has announced the appointment of Ronald C. Beckett as chief engineer of their oil filter division. Mr. Beckett has specialized in oil filtration since 1944 and came to Michiana from the oil filter division of Walker Manufacturing Company. He is a member of the Society of Automotive Engineers and the American Society for Metals. Mr. Beckett, a native of Ireland, received his schooling at St. Andrew's College and the Royal College of Science in Dublin. He came to America in 1926 and since that time has obtained wide experience in the automotive industry.

Florida Diesel News

By Ed Dennis

THE EUCLID DIVISION, GMC, announces the following Florida dealers: Llewellyn Machinery Corp. of Miami, southeastern part, including the Lake Okeechobee area; and Florida-Georgia Tractor Co., in Tampa and north to Jacksonville.

THE CORPS OF ENGINEERS at Jacksonville will receive three Model 38D8⅛ Fairbanks-Morse diesel engines rated at 960 hp.

NEW ADDITIONS to highway transportation include a GM tractor with 6-71 diesel and Fruehauf refrigeration trailer, to be used for transporting citrus products for Willard Perry of Haines City. Also a Cummins-powered Autocar tractor-trailer for Watkins Motor Lines.

FLORIDA Diesel Engine Sales, Jacksonville, powered Don J. Ball's new Huckins 52-ft. yacht with a pair of General Motors 6-71 inclined diesels.

PETTER Diesel Division of Brush Aboe, Inc., announces the appointment of Neff Machinery Inc., Miami, to handle industrial engines, and Southern Diesel Engine Sales, Ft. Myers, to cover the marine field along with M. D. Moody & Sons, Jacksonville.

AT TAMPA, Cummins Diesel Engines of Florida repowered a gasoline tractor for Great Southern Trucking Co., installing a 150 hp Cummins JBS diesel.

AN ENTERPRISE direct-drive diesel was selected for repowering the 250-ft. freighter *Mayhaven*. Rated 600 hp at 400 rpm, and costing approximately $47,000, it will increase the ship's speed from 7 to 11 knots.

TWO SPEEDSPRAYERS were repowered with GM 4-51 diesels by General Engine & Equipment Co., Tampa. One was for Brooksville Citrus Packers Association and the other for Covington Groves. Both will be used for spraying citrus trees.

THE *Shoals*, a new 72x19 shrimp trawler launched at Tillakos Boat Co., Fernandina Beach, for H. F. Sahlman, is powered with a D337 Caterpillar diesel rated 250 max. hp. It has Snow-Nabstedt reverse and reduction gears.

A HAMILTON diesel will be the new addition to the St. Cloud power plant. This 5-cylinder engine, rated 2500 hp at 257 rpm, will power a 1700-kw generator. Bunker "C" fuel oil and De Laval oil purifiers will be used.

TO POWER a sawmill, Blake Lumber Co., Tampa, purchased a Model 6-71 General Motors diesel engine and power take-off from General Engine & Equipment Co., Tampa.

THE City of Greensboro, N. C., has ordered a Model 38F5¼ Fairbanks-Morse diesel of 10-cylinders, rated 750 hp.

FLORIDA-GEORGIA Tractor Co., Miami, delivered a Model 95 Northwest dragline with a 21 Murphy diesel to Diamond Bros. for use on Virginia Key sewer outfall. Plantation Key Development Co. received an International TD-8.

HERCULES Motors Corp. new distributors are: Green Irrigation Co., Live Oak, for Hamilton, Suwannee and Lafayette counties, and O. R. Shields, St. Mark, marine dealer for his locality.

PENINSULAR Armature Works installed for the North Miami Water Works, a pair of GM 6-71 100-kw generating sets, and at Stevens Market, a 60-kw GM-powered diesel generating set.

A 6-CYLINDER Hercules diesel, rated 115 hp at 3000 rpm, was installed by Auto Marine Engineers on the new 38-ft. inshore trawler built by Riverside Boat Works.

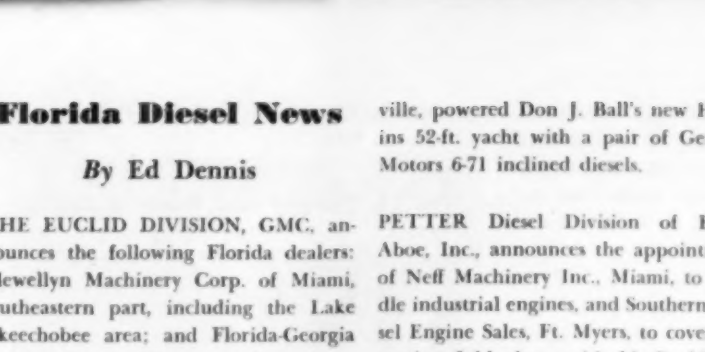
DADE DRYDOCK Co., Miami, is building a 28-ft. tug to be used as a tender for the Toppino Bros. dredge. A Murphy diesel (Model AAB134) with Twin Disc power take-off and 1.91:1 reverse and reduction gear, will be used along with a Westinghouse compressor. Ray Pearlson designed the tug.

THE APPOINTMENT of Richard Jordon as sales manager of Auto Marine Engineers, Miami, was announced by Plato Cox, president. Mr. Jordon was formerly connected with J. M. Keeley Sales, Miami, and previous to that he had owned a sales agency for Huckins Yacht Corp.

GM Distributor

The Detroit Diesel Engine Division of General Motors has announced the appointment of George W. Mercier, Inc. of Clayton, New York as a distributor for the GM Diesel line of marine diesels. In charge of diesel sales is Eugene Springman with Gerald Hayes and Glenn Delancy in charge of service and parts, respectively.

COOPER-BESSEMER CHOOSES Quincy COMPRESSORS FOR STARTING AIR



Quincy Compressors are standard equipment on Type JS-6 Cooper-Bessemer Diesel Engines. Cooper-Bessemer — like other leading engine manufacturers — have found that Quincy Compressors give them the long dependable service they require.

Rely on the experience and judgment of these engine makers, specify a Quincy Compressor for your next diesel starting job.

There's a model for every application. Sizes run from 1 to 90 c.f.m.

Write Dept. K-45 for our recommendations on the proper unit for your job.

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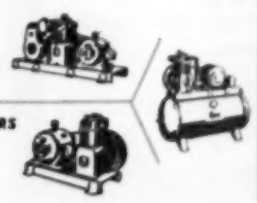

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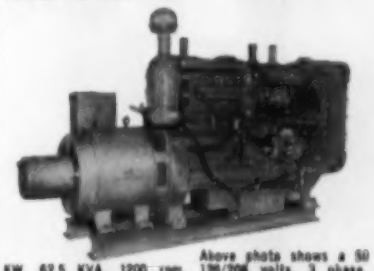
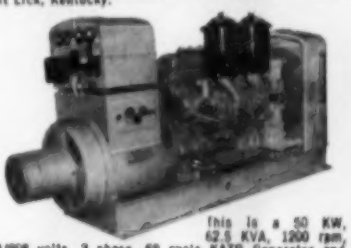
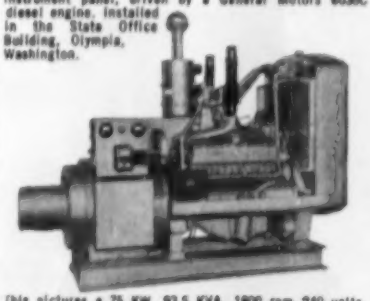


Above photo shows a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an International Model UD-18A diesel engine. Installed for the Mechanical Construction Division in Salt Lick, Kentucky.



This is a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by a General Motors 6030C diesel engine, installed in the State Office Building, Olympia, Washington.



This pictures a 75 KW, 93.5 KVA, 1800 rpm, 240 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an H-540 LeRoi engine utilizing natural gas for fuel. For Republic Steel Corporation of Gary, Ind.

An illustration of KATO's versatility: A 350 watt KATO Generator driven by a Lauson LMH engine and a 150 KW, 187.5 KVA, 750 rpm, 120/208 volts, 3 phase, 25 cycle KATO Generator and instrument panel—driven by a General Motors twin 6-71 diesel engine. For Duluth, Missabi & Iron Range Railway.

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Gasket Cutter

A new Dovetail precision gasket cutter has been developed by the Parks Tool Company, Neodesha, Kansas. Many requests have been made by operators and superintendents of diesel plants for a dovetail cutter that would give a precision gasket cut as shown. The research and developmental department of Parks Tool Company found that there is a definite need for such a tool. It was found after interviewing several operators of diesel engines that strip gasket material invariably will crack and break when unrolled if stored for six months or longer. The majority of diesel engine operators buy their gasket material in large sheets and then cut those sheets into the lengths and widths as required by the particular job as it arises.

The time required to cut gasket strips is about two hours for the average diesel but it takes four times as long, approximately eight hours, to dovetail the gasket ends—with considerable waste of gasket material as well as labor. With the above information Parks engineers designed and built a precision tool with interchangeable blades for dovetailing 1 in., 1½ in., and 2 in. gaskets—a precision cut can be had everytime in a matter of seconds. For information write Parks Tool Co., P.O. Box 222, Neodesha, Kan. (ITS NEW)

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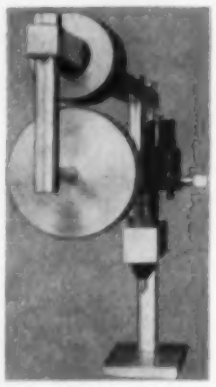
GM 71 Plunger and Bushing Tester



A new tool has been developed for shops working with the GM 71 injector. This tool tests the wear on the plunger and bushing throughout the working stroke. Tests may be made on bulk parts before assembly and on the completed injector before and after overhaul. In a new plunger and bushing, lubrication must be provided by a small amount of bypassed fuel which is lost from the injection stroke. As wear or dirt damage increases, more and more fuel is lost from injection due to blowby. The injector will then fail to inject a normal amount of fuel. This may show up as a low speed miss or as a lack of maximum horsepower output in cases where many of the injectors in an engine are worn.

The tool enables the shop to know what is being used, purchased, or scrapped and to match sets of injectors if desired. Accumulations of doubtful plungers and bushings may be tested in a quick fixture which can be made in a few minutes by the user. Such tests may be made at the rate of 24 per hour, with this fixture.

All testers are made to a 5% standard of accuracy, and readings in one shop may be reliably compared with others. The test does not take the place of the standard test. It does answer the expensive question: "Will it pump or must it be replaced?" The tool has been field tested in a number of shops for more than a year. It is rugged, simple and accurate and can go in the field without damage. The weight is 12 lbs. The present price, subject to change, is $32.00 with instructions and print for the quick fixture. The tool is distributed by S. P. Beaman, 1425 W. 216 St., Torrance, Calif. (ITS NEW)

Petter Expansion

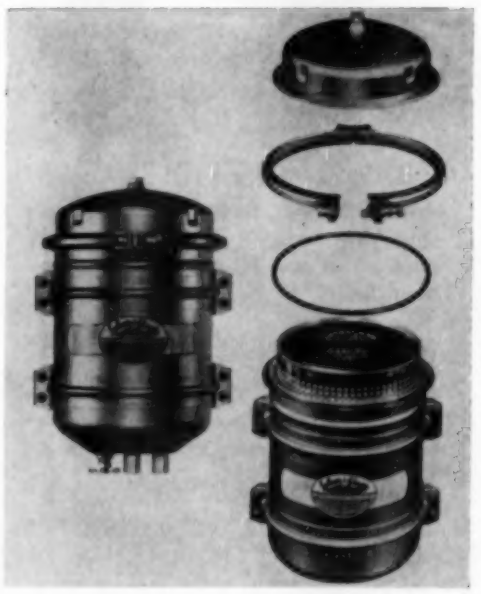
The Petter Diesel Engine Division of Brush Aboe, Inc. announce the appointment of two new distributors to represent them in Florida. Neff Machinery, Inc., 2601 N. W. 5th Avenue, Miami, will concentrate on the sale of Petter industrial engines, while Southern Diesel Sales, 529 Palm Beach Blvd., Fort Myers, will cover the marine range. Both these companies will carry a substantial stock of Petter engines and parts as well as the Petter small generating sets. Petter is also represented in Florida by M. D. Moody & Sons of Jacksonville, who have been very successful over the past few years in their efforts to sell these small diesel engines. The new appointments in Florida are part of Brush ABOE, Inc.'s plan to set up a wider network of distributors in the Southeastern States. Earlier this year they opened a branch office in Jacksonville under the direction of Mr. M. Antz and this has placed them in a better position not only to extend their coverage but to assist in the promotion of their products in this area.

Heads New York Domestic Territory

C. M. Reagle

The assignment of C. M. Reagle as district manager of Cooper-Bessemer's New York domestic territory has been announced by Stanley E. Johnson, Sr., vice president of The Cooper-Bessemer Corporation, Mount Vernon, Ohio. Presently a vice president and director of Cooper-Bessemer, Mr. Reagle is also manager of Marine Sales for his company. His new capacity as district manager of the New York domestic territory, will enable him to keep close personal contact with rapidly growing applications for centrifugal and reciprocating compressors in the New York area. He will also be responsible for sales of diesel engines, gas engines and gas-diesel engines in the power generating field and the marine industry.

New Model Luber-Finer Announced



The success of the Luber-finer filter units, Models 500-C and 750-C, introduced by Luber-finer, Inc., in 1954 for engines with up to 5-gal. and 8-gal. crankcase capacity, has prompted the addition of a new 1955 Luber-finer unit designed for smaller capacity engines. The new Luber-finer model, 272-C, was developed for mobile, stationary and marine engines with up to 3-gallon crankcase capacity. Although incorporating all the time-tested, patented filtering qualities and the rugged, lasting construction for which Luber-finer has been known since 1936, the new unit is smaller, lighter and easier to mount in limited space than the 500 and 750 Series units. The 272-C, with Luber-finer's single bolt closure, offers the same simplified pack replacement that met with such immediate acceptance when offered to the trade in the new 1954 Luber-finer models 500-C and 750-C.

Also, the new Luber-finer model incorporates the positive sealing "O" ring type gasket that assures leak-proof lid closure at all operating pressures, and the same one-piece extruded steel housing and rugged mounting bracket design. An outstanding feature of the new 272-C model is the screw-in type Luber-finer pack that assures a positive pack seal and eliminates the possibility of oil ever by-passing the Luber-finer pack. For further details, write Luber-finer, Inc., 2514 South Grand Avenue, Los Angeles 7, California. (ITS NEW)

General Manager Of Manufacturing

J. E. Adams

Joseph E. Adams, director of purchasing and planning, The White Motor Co., has been named general manager of manufacturing of the White Truck Division, according to J. N. Bauman, executive vice-president in charge of this Division. Mr. Adams joined White Motor in May, 1944, and soon after that he was appointed Director of Material Control. Born in Cleveland 42 years ago, he received his ME from Carnegie Tech.

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Superior: Diesel or Dual Fuel. 8 cyl. 14½"x18" Model VDSB engine, 327 RPM. E.M. generator, 2,400 V, 3 ph. 60 cy. Complete with heat exchanger cooling, switchboard, and accessories.

●

480 KW

Superior: Gas. 8 cyl. 14½"x18" Model VDSC, 327 RPM. G.E. generator, 2,400 V, 3 ph., 60 cy. Complete with heat exchanger cooling, switchboard, and accessories.

●

1000 KW

General Motors Diesel: 16 cyl. 8¾"x10½" Model 16-278A, 720 RPM. E.M. generator, 2,400 V, 3 ph., 60 cy. Complete with radiator cooling, switchboard, and accessories.

●

1200 KW

Chicago Pneumatic: Dual Fuel. 8 cyl. 16"x22" Model 862-CPS-DF. 327 RPM. E.M. generator, 2,400 V, 3 ph., 60 cy. Complete with radiator cooling, switchboard, and accessories.

●

350 KW

Superior: Gas. 8 cyl. 12½"x15" Model LOC., 400 RPM. G.E. generator, 480 V, 3 ph., 60 cy. Complete with heat exchanger cooling, switchboard, and accessories.

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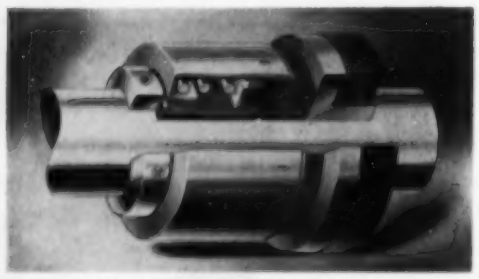
Vice President of Operations

James J. Reynolds

James J. Reynolds has been named vice president-operations of Alco Products, Inc. P. T. Egbert, president announced recently. Formerly vice president of industrial relations, Mr. Reynolds now will be in charge of all manufacturing, procurement and material control operations of the company, as well as employee services and industrial relations. He will continue to make his headquarters at Alco's Schenectady plant.

G. Y. Taylor's position as manager of employee services is also a new appointment. Formerly director of personnel and training, he will now be responsible for the company's pension and insurance plans, wage and salary administration, workmen's compensation, plant protection and security, catalogs and technical publications and the activities of the Alco diesel locomotive school.

Mechanical Seal



Sectional view of Garlock Mechanipak Seal Package Type BB-21A.

A mechanical seal, specifically designed for use on rotary shafts at pressures up to 150 psi, has been announced by The Garlock Packing Company, Palmyra, N.Y. Known as the Garlock BB-21A Mechanipak Seal, it is furnished completely assembled, ready to install. Standard construction includes brass shell, brass washer, and Buna-N bellows. Seals are available for shafts from ⅜-in. to 3-in. diameters.

Buna-N or neoprene bellows are furnished for operating temperatures up to 212°F. and pressures up to 150 psi. Silicone bellows are provided for temperatures up to 400°F. where pressures do not exceed 50 psi. The seals are designed for use on rotary shafts of various types of equipment.

Complete information, including sectional drawings, charts, diagrams, are contained in Garlock's new 8-page Catalog, Bulletin AD-150. Copies may be obtained by writing The Garlock Packing Company, Palmyra, N.Y. (ITS NEW)

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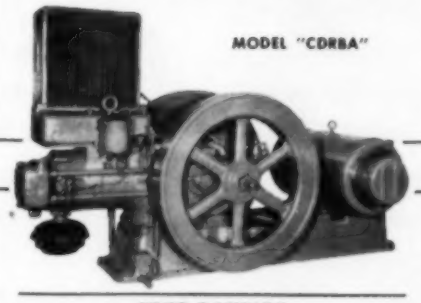

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Model	Cooling	Continuous Rating KW	Continuous Rating Engine rpm	Drive
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"BDRBA"	Condenser	4.9	900	V-Belt
"BDTBA"	Tank	5	900	V-Belt
"LDRBA"	Radiator	5.4	1350	V-Belt
"LDTBA"	Tank	5.7	1350	V-Belt
"CDRBA"	Condenser	7.7	750	V-Belt
"CDTBA"	Tank	8	750	V-Belt

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Heads Enlarged Sales Region

E. F. Hobbins

The White Motor Company has consolidated its Eastern and North Atlantic regions into a single operating unit to be known as the Eastern Region with headquarters at 547 West 47 Street, New York City, present location of the North Atlantic Region headquarters. At the same time, E. F. Hobbins, formerly Eastern regional vice-president, has been placed in charge of the new enlarged region which will handle both White and Autocar sales and service, P. E. Tobin, White general sales manager, has announced. Mr. Hobbins has had long experience in the truck transportation industry and is well-known nationally among truck owners and operators. He joined White in 1930 and was manager of the New York branch until 1938 when he was promoted to assistant general sales manager in Cleveland, then became vice-president of the Eastern Region in Philadelphia.

In his initial move as head of the enlarged region, Mr. Hobbins announced the appointment of Harry D. Weller, Jr., as assistant regional manager and Norman L. Kirsch as manager of fleet sales. Both Messrs. Weller and Kirsch have been associated with White Motor in the New York regional sales offices.

Worthington Engine Installed

One of Worthington Corporation's newest SW 14 supercharged engines, a 16-cylinder V-unit, will be installed at the municipal power plant in St. George, Utah. The new engine, largest of the company's new SW 14 line, is a high pressure turbo-supercharged four-cycle design, with a 4000 horsepower rating at 450 revolutions per minute. St. George's diesel plant first commenced operations in 1942 when two Worthington four-cycle direct injection diesels were installed. Since then, increased demands for power has resulted in the addition of several other Worthington engines. The SW-14 engine will be installed adjacent to two other Worthington engines which have been operating on a heavy wax distillate fuel oil since 1942.

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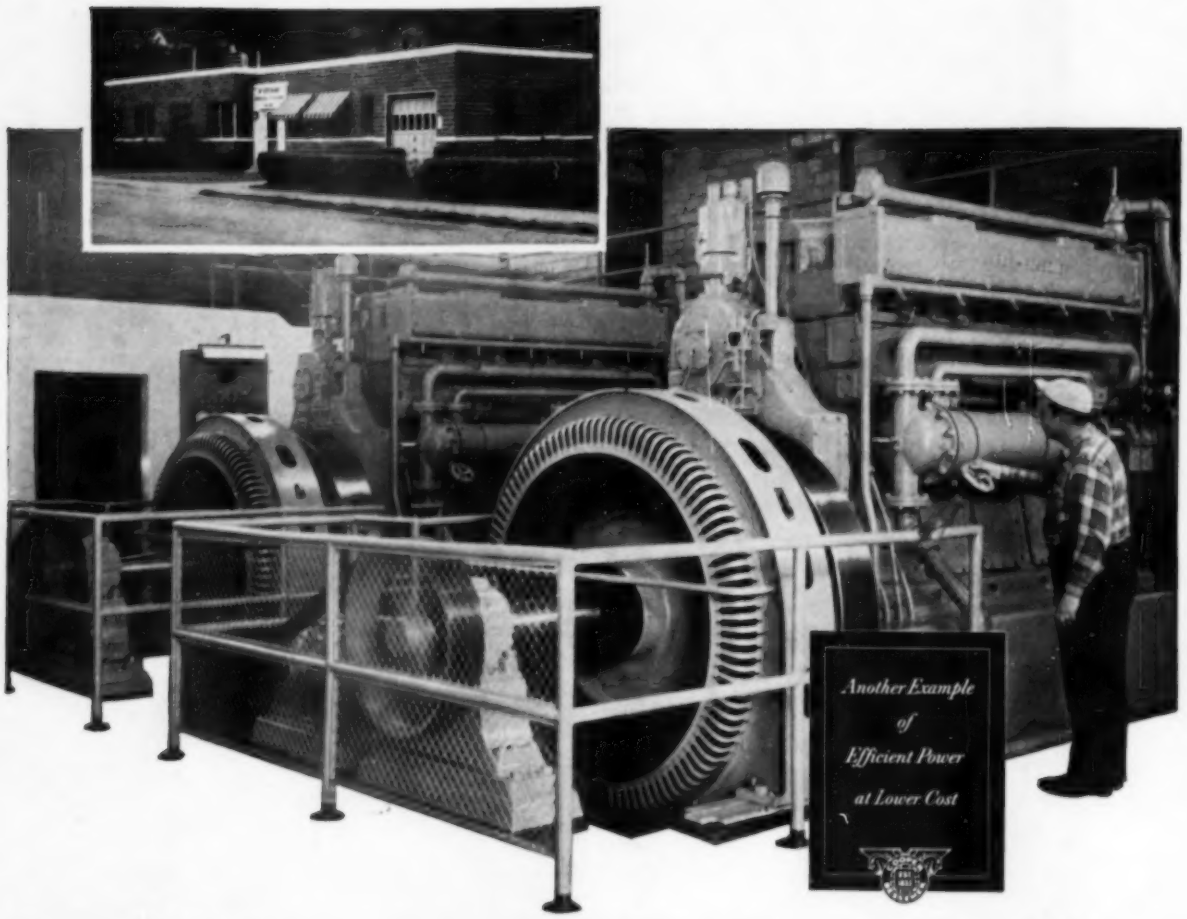

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